

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

Vol. XXIX. No. 7.

OCTOBER, 1922.

NOTES FOR THE MONTH.

SPEAKING at the Town Hall, Cowbridge, on 19th September, Sir Arthur Boscawen, Minister of Agriculture, said that agriculture was going through a very serious crisis. The temporary prosperity of the war period and the years immediately following the armistice had disappeared and the industry was suffering from one of those periods of acute depression which the history of British agriculture showed occurred from time to time. All industries were depressed to-day, but he thought agriculture was probably the most depressed of all industries. The present year had been particularly disastrous, the cold wet summer and the difficulty of harvesting the crops had greatly added to the difficulties of the farmer who had to contend with a further fall of prices, especially in respect of corn and potatoes. The fall in the latter was chiefly due to the collapse of the German exchange, which resulted in the Germans being unable to buy Dutch potatoes, as was the usual practice, and the Dutch potatoes were, therefore, dumped here. In addition, there was a large supply of home-grown early potatoes which was put on the market at the same time.

With regard to corn he had heard of very low prices being given for English wheat, and he was afraid that there was a great tendency among farmers to rush their wheat, much of which was in bad condition owing to the weather, on to the market. He quite understood that farmers were hard up and wanted ready money, but if they could only hold off for a time they would prevent prices being driven down to a disastrous level. When things went wrong in any industry now, it was customary to look to the Government for help. Farmers were no exception to this rule. As a matter of fact, Governments could do little to help trade and Government interference often

(45087). P.I.R.3. 10,500. 10/22. M. & S.

A

did a great deal more harm than good. Although as Parliamentary Secretary to the Ministry he had piloted the Agriculture Act through the House of Commons, it was certain that the country, which was pre-eminently an industrial one, would not pay heavy subsidies to the agricultural interest, and indeed it could not afford to do so. He had come to the conclusion that to make agriculture a spoon-fed industry and to couple this with wholesale Government control and interference was the wrong way of proceeding.

Assistance must be given in other ways, and his idea was that they should look rather to an extension of credit facilities to enable permanent improvements to be carried out and to help farmers in the conduct of their business and also to lightening the crushing burden which fell on agricultural land. Something had been done this year by the change in the valuation for Income Tax, but more would have to be done. He was working himself on these lines, and he could assure agriculturists that they were not without sympathisers in the Government. It was recognised that the gradual destruction of country life and the drain of the rural population into the towns was a grave danger to the country. He should like to see a great extension of smallholdings, with easy facilities for the purchase of their holdings by their occupiers so as to build up a race of peasant proprietors. Smallholdings could often be made to pay when large farms would not.

One thing from which farmers and consumers alike were certainly suffering was the excessive profits made by middlemen. He had been preaching co-operation for years, but so far not with very great results. But what could be done when farmers acted together was shown by the recent agreement made with regard to milk prices, on which he congratulated the National Farmers' Union. Beyond all things co-operation and goodwill between landowners, farmers and labourers was essential. All were suffering alike now.

In this connection he called attention to the fact that most of the Conciliation Committees, which had been a great success up to date, would be revising their agreements in the next few weeks. When things went wrong and prices fell, the temptation to the farmer to make drastic cuts in wages, which represented nearly half his costs, was very great, but he hoped and indeed felt sure that notwithstanding their difficulties farmers would be reasonable and would not attempt to drive wages down below the subsistence level. If they did, they would entirely alienate public opinion, and there would be an instant

demand for the re-establishment of the Agricultural Wages Board, which, in his opinion, would do great harm to the industry.

Speaking of the Canadian cattle question, Sir Arthur said that he had always been opposed to a change in the wise policy adopted in 1896 for the protection of our flocks and herds. But he had been defeated in the House of Commons, and the House of Lords had also passed a modified resolution in favour of admitting them. He thought the best course for the agricultural community to take now was to accept the verdict, and to press for such regulations as would safeguard both the health and the purity of blood of our live stock, which was the finest in the world, and in respect of which we must not take any serious risks. At the same time, the regulations must not be such as to prevent trade, but he thought arrangements could be made under which no serious injury would ensue.

In conclusion, he urged his audience not to be too down-hearted; agricultural prosperity would return.

* * * * *

THE Right Hon. Sir Arthur Boscawen, Minister of Agriculture, has sent the following letter, dated 7th September, 1922,

Conciliation Committees: to the chairmen, members and secretaries of Conciliation Committees:—

Letter from the Minister of Agriculture.

It is now twelve months since the Agricultural Conciliation Committees were established, and with the close of the first year's working I desire to express my thanks to the members and officers of the Committees for the public-spirited service which they have rendered to agriculture in carrying out their somewhat trying and invidious duties. The period when the Committees were established, coinciding as it did with heavy falls in the prices of farm produce, made the task exceptionally difficult, but the success which has attended the new system can be judged by the fact that out of sixty-one Committees which have been formed fifty-five have reached agreements during the year.

In many cases the current agreements are due to expire within the next few weeks, and I hope that both sides in considering new agreements will bear in mind the advantages of making them for reasonably long periods. When the Committees first started it was natural, especially in view of the uncertainty of the agricultural position at that time, that agreements should be made for short periods only. Subse-

[Oct.,

quently, many Committees were able to reach agreements covering the whole summer, and it may well be that half-yearly agreements will become the rule in future. Frequent changes in wages are unsettling to both employers and workers, and a review of the position every half year affords a reasonable opportunity for either side to secure adjustments as it considers necessary.

It is gratifying to observe that many of the Committees have welcomed the presence of a representative of the Ministry at their meetings, and in this connection I have received many personal expressions of thanks from both sides. The responsibility for decisions as to wages rests, of course, solely with the Committees themselves, but, as in the case of similar bodies in other industries, the presence of a completely impartial person is often of assistance to both parties in the conduct of their negotiations, and needless to say I shall be glad to place the services of suitable officers at the disposal of the Committees when desired.

Whilst the number of agreements made during the past year is very satisfactory as showing that the idea of settling rates of wages by mutual agreement has been accepted by the majority of employers and workers, the effective test of the utility of the present system is the extent to which the wages agreements are observed. From such information as is at the disposal of my Department it appears that the agreements have been, with few exceptions, very well observed. The importance of avoiding even these few exceptions is obvious, and in cases where certain individuals persist in breaking away from the terms of a Committee's agreement I suggest that the Committee should appoint a special Sub-committee to consider such cases and endeavour to bring the offenders into line. If such steps fail and non-observance of the agreement continues, the Committee should then, in the common interest both of employers and workers, consider the desirability of making the agreement binding by submitting it for confirmation.

The important point at the moment, however, is the settlement of wages for the coming winter, and I hope that the Committees will take up this question at an early date in a spirit of mutual goodwill which will lead to a successful conclusion.

A Review of the work of the Conciliation Committees during the past year appears on p. 648.

* * * * *

ON 12th August last the Permanent Court of International Justice delivered its opinion on the question raised by the French Government as to whether the competence of the International Labour Organisation extends to the international regulation of the conditions of labour of persons employed in agriculture.

International
Labour
Organisation and
Agriculture.

It will be remembered that the International Labour Organisation was established by the Peace Treaty to deal with labour conditions throughout the world, and in connection with the International Labour Conference held at Geneva in 1921 the right of the Organisation to deal with agriculture was disputed by the French Government. The question, which turned mainly on the interpretation of the Treaty, was referred to the Permanent Court of International Justice.

The Court after hearing evidence delivered a considered judgment in the course of which the meaning of the relative portions of the Treaty was fully discussed. The conclusion finally reached by the Court was that "the competence of the International Labour Organisation does extend to international regulation of the conditions of labour of persons employed in agriculture, and it therefore answers in the affirmative the Question referred to it."

The following supplementary question was also considered:— "Does examination of proposals for the organisation and development of methods of agricultural production, and of other questions of a like character, fall within the competence of the International Labour Organisation?" This the Court answered in the negative, observing, however, that although the consideration of the means of production in itself would be alien to the functions of the International Labour Organisation, "it does not follow that the Organisation must totally exclude from its consideration the effect upon production of measures which it may seek to promote for the benefit of the workers," or that it should be "excluded from dealing with the matters specifically committed to it by the Treaty on the ground that this may involve in some aspects the consideration of the means or methods of production."



AT no time was it more necessary for home producers to make great efforts to retain their position in the home markets, and this can best be done by grading and packing produce according to approved methods and presenting it on the market in the most attractive manner. Exhibitions of fruit which attract the general public have great usefulness in inducing increased consumption, and should afford the grower the opportunity to demonstrate the superiority of the home-grown article.

In so far as fruit and vegetables are concerned, an opportunity will be afforded for so doing at the Imperial Fruit Show, which the "Daily Mail" are organising to be held at the Crystal Palace from 27th October to 4th November, with the support, not only of this Ministry, but that of the Departments of Agriculture of Canada and South Africa, and also of the Fruit Trades Associations of these countries. The competition will not, as in 1921, be confined to apples, but will embrace most classes of fruit then in season, also tomatoes and potatoes. By such exhibitions the producers in the British Empire will have a unique opportunity of demonstrating the excellence of the fruit and vegetables grown within the Empire, while British growers, through competition, will profit much in the art of grading, packing and presentation.

At the previous Exhibition held in 1921, the home growers secured many of the premier prizes; and the exhibits generally showed that in the grading and packing of fruit progress was being made, yet the low marks awarded by Judges in many cases show that there is still room for improvement. After the Show each exhibitor was informed of the marks awarded by the Judge for his individual exhibits, and in the article on the Imperial Fruit Show of 1921, which will be found on page 659 of this *Journal*, the writers have dealt with the lessons to be learnt by a study of the Judges' score-card.

* * * * *

THE fruit-growing industry has suffered very many handicaps in past years, and not the least of these has been the

Standardisation of Chip Baskets. chaotic condition of the various containers in which the produce is marketed. This has been especially the case with soft fruit such as strawberries.

The chip baskets in which this fruit is carried, although ostensibly of the same denomination, vary widely in their cubic

capacity, and growers are unable to know the exact weight of the fruit they are forwarding unless they weigh each individual basket. The retailer who buys these baskets in the market justly condemns those which are under-weight, and the loss is perforce borne by the grower, who has also to face the loss entailed by baskets in which over-weight is given.

It is satisfactory to note that all sections of the industry are becoming alive to these drawbacks, and that steps are being taken gradually to remedy matters. The first step was the formulation of the grading and packing scheme of the Federation of British Growers, which has led to the adoption of the British Standard boxes for apples. A second step was taken at the Imperial Fruit Show last year, when the question of the standardisation of chip baskets was discussed at a meeting of the basket manufacturers. The meeting decided that such standardisation was desirable, and as a result inspectors of the Ministry of Agriculture carried out investigations an account of which will be found in the article on page 605.

* * * * *

INDEX numbers of prices of agricultural produce in England and Wales show that prices in August were on the whole lower than in July, the average increase in **The Agricultural Index Number.** price compared with the corresponding month of the years 1911 to 1913 being 67 per cent. in August against 72 per cent. in July.

The following table shows the increase each month since the beginning of 1921, comparison in each case being made with the corresponding month in 1911 to 1913:—

Month.	Percentage Increase in Prices.		
	1921	1922	
January	... ... 183	... ... 75	
February	... ... 167	... ... 79	
March	... ... 150	... ... 77	
April	... ... 149	... ... 70	
May	... ... 119	... ... 71	
June	... ... 112	... ... 68	
July	... ... 112	... ... 72	
August	... ... 131	... ... 67	
September	... ... 116		
October	... ... 86		
November	... ... 79		
December	... ... 76		

Most kinds of agricultural produce showed little change between July and August. Both wheat and oats declined in price

on the month, but as a decline is not unusual at the commencement of the cereal year, the actual comparison with pre-war years shows no change for wheat and a rise for oats. It should be noted that new corn did not reach the markets until late in August this year and the fall in prices is not fully reflected in the index figures.

Live stock generally are also practically unchanged, the downward movement of sheep prices having almost ceased during August. Milk shows a rise, but cheese and butter are little altered. Eggs show a fall, the rise in price from July to August being relatively less this year than in pre-war years, while a general reduction is recorded in poultry. Hay is decidedly dearer, and, following the steady advance which has been maintained since March, prices in August were over 50 per cent. above those ruling in August 1911 to 1913.

The chief cause of the decline in the general index number is the fall in value of fruit and vegetables, especially potatoes. Throughout the month potatoes declined and at the close were barely at their pre-war figure. Green vegetables also became much cheaper, while fruit, owing to the heavy crops of apples and plums, averaged only 10 per cent. above pre-war prices, as compared with a July figure of 155 per cent. for soft fruit.

The following table shows the average increases in value of the principal commodities since January:—

PERCENTAGE INCREASE AS COMPARED WITH THE AVERAGE PRICES RULING IN
THE CORRESPONDING MONTHS OF 1911-13.

	Jan.	April.	May.	June.	July.	August.
Wheat	... 44	57	62	60	53	53
Barley	... 51	49	49	58	49	48
Oats ...	... 49	49	53	57	55	59
Fat cattle	... 62	65	70	71	70	70
Fat sheep	... 60	128	140	121	107	103
Fat pigs	... 71	90	91	82	91	92
Eggs	... 114	89	50	69	80	85
Poultry	... 76	83	110	116	103	70
Milk ...	... 125	42	27	28	53	77
Butter	... 46	49	54	59	50	51
Cheese	... 27	46	48	55	75	14
Potatoes	... 113	95	140	80	37	54
Hay ...	... 35	28	33	35	*	*

* * * * *

THE BEGINNINGS OF FIELD DRAINAGE.

H. G. RICHARDSON, M.A., B.Sc., and G. E. FUSSELL,
Ministry of Agriculture and Fisheries.

FROM the earliest times when we have any definite information about agricultural practice in the island of Britain we learn that men were draining land which was otherwise unfit for pasture and tillage. The evidence for defensive works for low-lying land against the sea or river is much earlier than the evidence for field drainage. Even where there is no documentary evidence the dike and wall builders have left a monument behind them: and although we may dispute as to the age of the oldest dikes and walls at Romney Marsh or in Lincolnshire—and indeed archaeology seems as yet to give no very certain answer—it is likely that the Romans saw them, it may be already there when they came, but at least constructed before Rome abandoned Britain to its fate. The contractor for inning marsh-land had already appeared in the thirteenth century*—he was not, as is very generally supposed, a discovery, under the title of *undertaker*, of Tudor England—and it is from the thirteenth century, so far as we are aware, that the first reference to field drainage in England occurs in the treatise written by Walter of Henley.† The drains Walter describes are water furrows for running off the surface water and he does not mention any other form of drain. Since, however, the Latin rustic authors were accessible throughout the Middle Ages, Palladius in particular appealing to the mediæval mind, the classical methods of open and covered drains must have been well known, even if, as is quite possible, the tradition had not passed on unbroken from generation to generation of farm labourers. Palladius appeared in an English dress early in the fifteenth century, and there is every reason to believe that the Chaucerian stanzas of the vernacular version describe, at least so far as draining is concerned, not only classical precept but mediæval practice as well: the farmer was told to make—

“A furrow three feet deep thy landēs thorough,
 With gravel or with little pebblē stonēs
 Unto the midward filled.”

If stones were lacking, “*sarment*,” straw or lop would serve.‡

* *Axsize Roll No. 911*, m. 7d.

† *Walter of Henley's Husbandry*, pp. 16, 17.

‡ *Palladius on Husbandrie* (Early English Text Society), p. 150: *sarment* = Latin *sarmenta*, clippings from plants, especially vines.

At the end of the Middle Ages, Fitzherbert, who in this as in all other points describes mediæval practice, directs that if open drains "wylle not make the marres grounde drie, then you must make a soughe undernethe the erthe, as men do to get cole, yron, stone, leade or tynne."^{*} This suggests that there had been a departure from the classical practice of cutting a channel and filling first with stones or brushwood and then with soil; and the method recommended by Fitzherbert was, there can be little doubt, that still practised in the seventeenth century in Staffordshire. "Mr. Sylvester, of Welford," we are told, "first digs a hole deep and large enough to receive a *Man* together with his instrument like a shovel, then he excavates the *hollow black earth* as far as his instrument will reach both ways, i.e., about eight foot beside the diameter of the hole, leaving the upper turf thick above it; then at the same distance on a *line* from eight foot to eight foot, he makes other *holes*, and so still on as the work requires, and then putting in Alders . . . or other fit materials, as *brush-wood* to keep the earth from falling in and choaking the *Sough*, it will drain the ground to that rate, that many times it will sink a yard or more."[†]

The classical practice was, however, that commonly followed in the seventeenth century. Walter Blith advocated drains three to four feet deep, filled first with faggots of willow, alder or lime, covered by turf and then with fifteen inches of stones, soil being placed on top:[‡] this combines the two methods described by Palladius and other classical writers. There were other variations in detail: in Oxfordshire, for example, an "*ingenious Husbandman*, that having dug his trenches about a yard deep and two foot over, first laid at the bottom green *Black-thorn* bushes, and on them a *stratum* of large round stones, or at least such as would not lie close; and over them again, another *stratum* of *Black-thorn*, and upon them *straw* to keep the dirt from falling in between, and filling them up: by which means he kept his trench open, and procured so constant and durable a drain, that the *land* is since sunk a foot or eighteen inches, and become firm enough to support *carriages*."[§]

At the beginning of the eighteenth century there are notices of hollow brick drains as a substitute for drains of a classical model. A trench was cut and the bottom covered with bricks laid crosswise, other bricks being laid lengthwise at the sides

^{*} *Boke of Surveyinge*, c. xxxiv.

[†] Robert Plot, *Natural History of Staffordshire* (1686), p. 356.

[‡] *English Improver* (1649), pp. 23, 24.

[§] Plot, *Natural History of Oxfordshire* (1676), p. 249.

and these covered again with another layer of bricks crosswise.* At that time also something very like the principle of the mole drain had been discovered—"the best and cheapeſt Method of draining Clayey Land" and one that "will do as well in Pasture, Arable or Wood Lands, as in Gardens." The operation is thus described by Stephen Switzer, its advocate: "Be provided then of three or four narrow Spades, about eight Inches wide and fifteen Inches long, with a Handle put into a Socket and Ring, with a Tread round it to set the Foot upon to dig, and at every twenty Foot asunder if the Ground lye near a Level (which is the worst Case that can attend this Method) dig a narrow Trench of about ten Inches or a Foot wide at most, quite through your Gardens at twenty foot asunder . . . and a full Foot and half within the Clay: take a wooden Rowl of about five Inches Diameter at one End, of four Foot long and four Inches Diameter at the other; and placing this Rowl at the Bottom of your Trench, take the Clay you had before dug out, and with a Rammer ram it in round the Rowl, which will form a perfect Tube; and the Rowler being bigger at one end than the other, you may by the Help of a Chain fastened to the bigger End, pull it out of the Tube, so that proceeding at four Foot at a Time, you go through your whole Trench or Trenches from End to End, and all over your Garden; taking great Care to keep your Drains or Ditches on the Extremity of your Gardens, and at the End of the Tubes open.

"But this is not all, I should have premis'd that there should be a handle of about four Foot long, mortis'd into the great End of the Rowl, by which the Workmen shoggle about the Rowl, so as to loosen it in the Tube, by which Means the said Rowl will be the easier drawn out by the Chain aforesaid.

"I should have also set down, that before you move this Rowl you take a Puncher made in the form of a Pyramid a little broke off at the Top, about three Foot long, three Inches Diameter at the great End, and one at the small, with which Instrument (made of Wood as it is) you are to punch a Hole through the ramm'd Clay upon the Top of your Rowl, through which Perforation all the Water is to pass, that comes from the Ground above, down into the under-ground Drain or Tube below.

"And in order to keep this perforated Hole open, and not to be choaked up by the Earth's tumbling into it, you are to

* Stephen Switzer, *Practical Fruit Gardener* (1724), pp. 24, 25; A. Hunter, *Georgical Essays* (1770-72), III, 145 ff.

take some small Faggot-Wood or Furze-Bushes, and chopping them short, you are to cover the Hole therewith, adding at the Top a broad Tile to secure it from any Impression that may come from above." The result, says Switzer proudly, is that you have a "Field or Garden, as hollow and as unfit to retain stagnated Water as a Sieve." He claims that even in arable land he has known these "Tubes or underground Drains" to function after twelve years and that the cost was but about twenty shillings an acre, while where there was a gradient fewer drains would be required and the expense would be proportionately less.*

Switzer's method was not generally followed, but adaptations of it and methods embodying the same principle were practised in divers parts of the country, latterly under the name of plug draining.† The mole plough, which achieved the same result by drawing a cylindrical cartridge through the sub-soil, appeared towards the end of the eighteenth century and there seem to have been a number of types all coming into use about the same time. Harry Watts was granted a patent in 1797 for such a plough: it was to be drawn by four or eight horses and was to be used in a water furrow or the bottom of a trench.‡ The practice of using the early mole ploughs to work in a furrow appears to have been general and the drains were cut to a depth of about 15 or 18 in. but occasionally less§: the work was heavy and teams of horses up to the number of fourteen or even twenty were employed.|| The windlass system was introduced almost simultaneously: windlasses worked by eight men, sometimes by women, gave way to windlasses worked by horses.¶ The steam cable system which has now almost entirely superseded horse teams and windlasses did not make its appearance until the second half of the nineteenth century.

* *Practical Fruit Gardener*, pp. 25 ff.

† W. Ellis, *Modern Husbandman* (1750), i, 109; *Modern Land Steward* (1801), p. 254; John Johnstone, *Account of Elkington's System* (1808), p. 166; *Third Report of Select Committee* (1826), p. 7; *Quarterly Journal of Agriculture*, iv, 501 ff., and xi, 68 ff.

‡ Patent Specification No. 2195.

§ *Letters and Papers on Agriculture* (Bath and West of England Soc.), ix, 110; *Annals of Agriculture*, xxxvi, 399, and xlvi, 486; *County Reports, Cambridgeshire*, p. 244.

|| *Annals of Agriculture*, xxxvi, 399; *County Reports, Gloucestershire*, p. 260 ff., and *Cambridgeshire*, p. 244; *Quarterly Journal of Agriculture*, ix, 388; *R.A.S.E. Journal*, iv, 36.

¶ Patent Specification No. 2195; Patent Specification No. 2373; Richard Lambert's Patent (1800); *Annals of Agriculture*, xlvi, 413; *County Reports, Gloucestershire*, pp. 260 ff.; *Quarterly Journal of Agriculture*, ix, 388; *R.A.S.E. Journal*, iv, 36.

While the mole plough was slowly evolving, inventors were experimenting with solid conduits which would replace the old stone and brushwood drains, and at the same time mechanical methods of cutting trenches were here and there introduced. Although the earthenware pipe was known in the seventeenth century it was used for conveying water supplies and not considered for a long time as a means of draining land.* Channels made of brick were in use, as we have seen, about the year 1700, and these in turn suggested bricks with a semi-circular cavity which might rest on the earth or on flat bricks or might be placed face to face to form a circular tube.† A brick arch a foot wide and an inch thick, in shape like a ridge tile, was used in Shropshire,‡ and there was a great variety of specially shaped bricks which, singly or in conjunction, would form conduits of divers geometrical forms.§ Circular earthenware pipes, however, were employed in Essex and elsewhere before the end of the eighteenth century, and although other shapes have from time to time been employed|| (even so late as 1843 the Royal Agricultural Society awarded Silver Medals for oval, horseshoe and angular tiles)||; the circular pattern was finally generally recognised as cheapest and most effective.

As an alternative to cutting drainage trenches by hand, heavy ploughs were employed in the eighteenth and early nineteenth centuries: teams of eight, twelve and even twenty horses are mentioned.** The general principle embodied in these ploughs was to set two coulters parallel at whatever width it was desired to make the trench, and to clear the spoil by two long mould boards, the share, of course, making a level sole. Trenches could be cut a foot deep and eighteen to twenty inches wide at the surface. Grey's draining plough was fitted with two land wheels to run on either side of the drain and to regulate the depth of the cut: this plough was fitted in addition with a centre coulter to loosen the earth.†† The Royal Society of Arts awarded premiums for ploughs of

* Patent Specification No. 11: John Etherington's Patent (1613); R. Bradley, *Weekly Miscellany for the Improvement of Husbandry*, No. 8 (1727).

† Johnstone, *Account of Elkington's System*, p. 159.

‡ County Reports, Shropshire, p. 17.

§ Lawson, *Farmer's Practical Instructor* (1826), p. 535, Fig. vii.

|| Quarterly Journal of Agriculture, N.S. (1847-49), p. 372, and (1849-51), p. 563; R.A.S.E. Journal, iv, 369 ff.; v, 273.

¶ Ibid., iv, 371.

** Bradley, *Complete Body of Husbandry* (1727), pp. 33 ff.; Ellis, *Chiltern and Vale Farming* (1733), p. 326; *Reports of H. of C. Select Committee* (1836), iii, 7.

†† Lawson, *Farmer's Practical Instructor*, pp. 97 ff.

[Oct.,

this kind* and, among others, Arthur Young regarded their use with favour,† but in practice they seem to have shown no advantage over hand labour‡ and never came into general use. They fall properly into the category of contrivances "which have been invented but not found generally useful," as the *Farmer's Practical Instructor* has it,§ although of late years the essential principle has been revived in the Revoit Excavator which has achieved a very considerable measure of popularity in many countries.

The multitude of devices and inventions attested to the importance of drainage in the eyes of advanced agriculturists, but such drainage as was done for a long time followed on classical lines. It was not until the wave of improvements that set in with the repeal of the Corn Laws and the issue of public loans for drainage that modern methods became general. In 1826 mole draining was still uncommon. "The mole plough," it could be said, "is sometimes advantageously used in pleasure grounds, particularly such as have a declination of surface. It is also used with a good team to drain wet turnip land."|| The application of steam was necessary before mole draining could become an easy and economical operation in those districts where it was most wanted. Tile draining remained hand work, and, although arduous, was not an over-costly operation: many mistakes, however, were made and large sums of money lost in laying tile drains too deep. Since that time, about the middle of last century, when, as Lord Ernle says, "drainage became the popular improvement," the practice has had its periods of eclipse and has risen and fallen in popularity with the prosperity of agriculture. Of recent years the lack of skilled men, high wages and the expense of tiles have combined to put a check on tile draining; and its costliness has deterred farmers in many districts from employing contractors for mole-draining, which, moreover, in most cases requires to be combined with main drains of tile. The introduction of the internal combustion engine has, however, introduced a new factor, and once again there are many

* Dossie, *Memoirs of Agriculture*, i, 79.

† *Farmer's Tour of England* (1771), i, 61; ii, 237, 483, 518 ff.

‡ *Ibid.*, iv, 473 ff. This appears to be Young's final opinion: his comments upon actual working experience as contrasted with "a committee experiment of one hour" are instructive.

§ p. 97.

|| Lawson, *Farmer's Practical Instructor*, p. 98. Cf. W. Lester, *History of British Implements* (1804), pp. 186 ff; A. Gray, *Ploughwright's Assistant* (1808), pp. 137 ff; *Reports of H. of C. Select Committee* (1836), ii, 80, and iii, 6; *Quarterly Journal of Agriculture*, ix, 388 ff, and N.S. (1849-51), p. 562.

new ideas before the public aiming at reducing costs—mole ploughs, for example, of smaller bore than those usually employed, designed to be hauled by tractor, and machines of several types designed to cut trenches for tile drains.

The misfortune of draining operations in the past has been the lack of scientific knowledge of the relative efficiency of the different systems and methods offered to the farmer and the land-owner. Tradition and unsupported theory have too often been accepted as gospel. It is now generally recognised as essential that a scientific system of field drainage must be based, like all other farming operations, upon observation and measurement, and that exact knowledge cannot be easily acquired. Already work has been started in several countries and before long it should be possible to prescribe with accuracy the best system of drainage in any given circumstance and to give a substantially accurate forecast of its economic results.

* * * * *

THE AGRICULTURAL VALUE OF SEA-SAND.

W. BORLASE, N.D.A., and
ALEXANDER GREGG, B.Sc. (Agric.), N.D.A.,
Agricultural Dept., Cornwall C.C.

THE practice of applying sea-sand to the land is a very old one in Cornwall. The sand contains a large proportion of calcium carbonate from the shells of cockles, limpets, mussels and other varieties of shell-fish which are abundant on the coast.

Sources of the Sand.—In many places the beach is dry at low water for considerable distances seaward, and a fresh sea breeze will then carry the loose sand inland, and unless its progress is arrested by the cliff or running water it may spread over a large tract. The sand washed up during the period of spring tides may be blown away when left exposed during neap tides. In this way large areas, some of them several square miles in extent, have been covered by accumulations of sand in many districts along the coast, notably at Padstow, Perran Bay, St. Ives Bay and near the Land's End. The accumulations take the form of low hills and deep valleys or hollows, the hills or dunes being in many places 50 to 60 feet high from base to crest. Buildings have been buried and lost for ages until a removal of the sand by the wind or some other agent has again exposed them. As recently as in 1800 A.D. the sexton and worshippers

of Perranzabuloe regularly shovelled away the sand from the church doors on Sundays before they were able to enter the building.

At the present time the removal of the sand from one spot to another is almost entirely prevented by the growth of Marram Grass, Sand Reed or Sand Grass (*Psamma arenaria*, Beauv.), which almost entirely covers the dunes in all parts of the county. The first record of this plant in the county is given by Davey in his "Flora of Cornwall" as 1758 A.D., so that its introduction into Cornwall is comparatively recent.

The practice of carrying this sand for agricultural purposes is doubtless centuries old and enormous quantities were at one time being drawn annually. Probably its use was overdone in many places, for the idea that it was valueless was common in various districts a few years ago. During the last 20 years, however, it has been applied in increasing quantities and it has now entered into strong competition with burnt lime and ground limestone, proving in many localities to be the cheapest form of lime available to the farmer.

Application.—It is applied to the land in various ways, but, probably, most frequently as part of a compost or "mixed dressing." In the Penzance district the variety known as "lug sand" found at one part of the beach is carted to the farm and mixed with refuse from the broccoli crop, sea-weed, and farm-yard manure, the whole being allowed to rot down for a month or two, after which it is turned or dug over so as to mix the ingredients and then ploughed in for the potato crop. A somewhat similar plan is followed in other parts. Frequently the soil at the foot of the hedges (the so-called ditches) was at one time ploughed for three or four furrows wide and carted to some convenient spot in the field where it was mixed with sea-sand and dung. After being allowed to rest for a time it was dug over and mixed and then carted over the field. This plan was often adopted on temporary pastures before the cost of the labour involved made it more or less prohibitive. In other cases the sand is carted to the field and spread with long handled shovels from the cart as a dressing for grass. It is frequently used as litter either alone or in combination with straw (often from a mistaken idea of its value as an absorbent) and in this way finds its way to the manure heap and eventually to the soil.

The amount applied per acre varies widely, being larger near the coast. The average is from 4 to 6 tons per acre, but dressings of twice these weights are common.

Composition and Effects.—Its chemical effects on the soil would appear to be confined entirely to the action of the carbonate of lime which it contains in the form of powdered shell, for no other substance of agricultural importance can be found in appreciable quantity. It has been suggested that its value is due partially to the sodium chloride which it has retained from the sea water, but only the faintest traces of this substance can be found in sand taken direct from the beach, while in the bank or dune samples there would be even less.

In a series of carefully conducted tests carried out by one of the writers the following results were obtained:—

Situation.	Percentage of sodium chloride in sand.	Amount of salt in a ton of sand as carted.
Penzance lug sand (wet)	... 0·78	... 171 lb.
Porthtowan beach (damp)	... 0·19	... 4½ lb.
Gwithian Bank (dry)	... 0·003	... 1 oz.
Bude Bank (dry)	... 0·008	... 2½ oz.
Harlyn Bank (dry)	... 0·002	... ½ oz.

Neither phosphates nor salts of potash or magnesia are present, none of these forming part of the material of the rocks and cliffs of this coast in determinable quantities. Samples of sand from most of the beaches around the coast have been tested by one of the writers and the proportion of carbonate of lime and the mechanical composition determined.

The table on p. 594 gives the percentage of carbonate of lime, its equivalent as lime (CaO), the amount of lime (CaO) in a ton of sand and the mechanical composition of samples around the coast of Cornwall from Bude to Plymouth.

This table shows that percentage of lime and mechanical composition have little connection or bearing on one another. One frequently hears it suggested that the fine sand is superior to the coarser in lime content; that blown sand is finer and therefore superior; that beach sand is better than bank, etc., but the table does not definitely bear out any of these contentions.

The cost to the farmer of the lime in the sand will depend almost solely upon the distance he has to cart it, the charge made for the sand when taken from the bank being merely a nominal one, while it may in most cases be taken from the beach free of cost. At the present time *burnt lime* is 48s. per ton at Truro delivered at the Railway Station, while *ground limestone* is 38s. per ton at the same place. As one ton of burnt lime is equal to 1½ tons of ground limestone from the same quarry it is very evident that burnt lime is much the cheaper of the two.

Locality.	CHEMICAL COMPOSITION.			MECHANICAL COMPOSITION.			
	CaCO ₃ % =	CaO %	CaO per ton of Sand,	Approx. value of Lime per ton of Sand at 2/- per cwt. of Lime.	Fine, —0·4 mm.	Medium, ·4 to ·6 mm.	Coarse, + 0·6 mm.
Bude	50·6	28·3	5·6	11·2	16·0	75·3	8·7
Poole	58·4	32·7	6·5	13·0	74·0	22·7	3·3
Paisley	53·1	41·1	6·2	16·5	12·5	63·1	24·4
Hartlyn Bay	73·4	47·3	9·5	19·0	1·6	13·5	85·9
Mawgan Porth	64·1	31·3	6·2	12·5	46·5	53·1	1·4
St. Columb Porth	55·9	31·2	6·2	12·6	36·4	62·1	1·5
Perranporth (beach)	55·7	27·5	5·5	11·0	10·4	74·1	15·5
Perranporth (bank)	19·2	29·1	5·9	11·9	47·3	51·8	0·9
Porthtowan	62·5	25·3	5·0	10·0	20·2	73·7	5·8
Gwithian	45·2	44·4	8·9	17·9	38·7	50·4	16·9
Connor Bar	79·3	41·7	8·3	16·7	27·5	54·3	18·2
Hayle	74·5	41·6	8·3	16·7	8·9	59·3	30·8
Lelant Ferry	74·3	33·2	6·6	13·2	23·7	69·2	7·1
St. Ives	69·3	38·0	7·6	15·2	—	—	—
Sennen	68·0	27·9	6·6	11·2	—	20·8	79·2
Portheinow	49·9	49·9	6·6	12·7	—	—	100·0
Penzance ("lug" sand)	56·6	31·7	6·3	12·7	95·9	3·0	0·7
Marazion ("lug" sand)	13·8	7·7	1·3	3·0	12·3	12·3	6·5
Porthleven	13·0	7·3	1·5	3·0	3·5	28·2	18·3
Gunwalloe	13·2	7·3	1·5	3·0	15·2	56·2	31·7
Helford River (estuary)	69·3	38·7	7·6	15·2	8·8	—	—
Maen Porth	32·8	18·0	3·6	7·2	—	—	—
Gyllyngvase (Falmouth)	33·5	18·7	3·7	7·5	1·6	24·0	61·4
Tonsgathio	13·6	7·6	1·3	3·0	23·6	53·8	74·5
Caerhays	43·9	24·5	4·9	9·9	3·9	21·6	7·1
Gorran	45·7	25·6	5·2	10·5	12·6	30·3	57·1
Folkestone (Clay)	31·8	17·8	3·6	7·2	69·7	23·3	7·0
Folkestone (Clay)	21·6	12·1	2·4	4·9	4·0	49·2	16·8
Leeds (Salter's) (clay)	13·5	7·5	1·5	3·0	4·2	26·3	62·5
Leeds (Salter's) (clay)	2·2	1·3	0·25	0·6	9·2	28·2	62·4
Leeds (Salter's) (clay)	19·5	14·9	2·2	4·5	46·7	24·9	24·7
Name (not inserted in S.S.)	...	...	...	...	10·7	59·2	15·2

Shell-sand from Perranporth is being delivered on farms near Truro (a distance of 9 miles) at 6s. per ton, and as it contains nearly 6 cwt. of lime (CaO) to the ton of sand it makes the cost of the lime about £1 per ton on the farm. Sand from Padstow is being sent inland by rail and delivered at the railway stations at the following prices per ton:—Bodmin 9s. 8d., Otterham 8s. 6d., Launceston 10s., Camelford 8s. 2d., Liskeard 9s. 8d. This sand contains not less than 8 cwt. of lime per ton, so that the cost of the lime in it is not more than 25s. per ton at points so far distant from the source as Launceston and Liskeard. Ground limestone at these two places is at present somewhere about 35s. per ton and as this contains not more than 11 cwt. of lime (CaO) per ton of limestone the lime in it must be something like 63s. per ton. This certainly compares very unfavourably with the cost of the lime in the sea-sand, so that Cornish farmers would be well advised to ascertain the respective charges on the various forms of lime available—burnt lime, ground limestone and sea-sand. Taking a few of the most important centres in the county the prices may be compared as follows:—

	<i>Per ton of Material.</i>			<i>Per ton of Lime (CaO) in</i>		
	Burnt Lime, 95 % pure.	Ground Limestone, 95 % pure.	Sea-sand, 65-75 % CaCO ₃ .	Burnt Lime.	Limestone.	Sea-sand.
Penzance	45/-	40/-	5/-	47/4	75/2	12/-
Truro	43/-	38/-	6/-	45/3	71/5	20/-
Liskeard	40/-	35/-	9/8	42/-	65/9	23/6
Launceston	40/-	35/-	10/-	42/1	65/9	24/8

The excessive cost of the limestone is largely due to the fact that, unlike burnt lime, its railway freight does not come under the agricultural rate. Thus, while burnt lime at the kiln, Newton Abbot, is 30s. per ton, ground limestone is only about 17s. 6d. per ton, yet at Penzance, Truro, etc., the difference in price is only 5s. per ton.

This leads naturally to the question of the comparative manurial values of the three substances. In the first, burnt lime, we have the lime in what is considered its most active form, the oxide, while in the other two the lime is present as a carbonate. As far as the mechanical condition is concerned the ground limestone is much finer than the sea-sand and it would therefore be considered quicker in action and, possibly, of slightly greater value. Beyond this there seems to be no advantage in lime or limestone over sea-sand.

Action on Various Crops.—A good deal of information is available as to the action of sea-sand on various crops. Experiments have recently been carried out by the Cornwall County

Council to ascertain its effect on temporary pastures and its value when compared with burnt lime and ground limestone. On one farm the three forms of lime were applied in December, 1920, to old grass land, the pasture being thin and poor—little more than Yorkshire Fog and Crested Dogtail with diminutive leguminous plants. Phosphates, potash and sulphate of ammonia were sown across the limed plots. Within a year a very great improvement was noticed on all the plots, but of the three which had received some form of lime that to which sea-sand had been applied seemed in most respects the best and this superiority is still being maintained.

On another farm, at Roche, a field of 8 acres received a rather heavy application of superphosphate, bone meal and basic slag for rape in 1920. Dredge corn (a mixture of oats and barley) was next taken and grass and clover seeds sown with the corn. Neither artificial manure nor dung was used for this crop but on three plots, each one acre in area, some form of lime was applied, viz., No. 1, 4 tons of sea-sand; No. 2, 2 tons of ground limestone; No. 3, half a ton of ground lime. Six months after, when the first inspection was made, the "seeds" over the whole field were very thin and there was still a good deal of spurrey, sheep's sorrel, silverleaf and selfheal, but these weeds were less conspicuous on the ground lime and the limestone plots than on the sea-sand plot. The unlimed part of the field showed a much larger proportion still of weeds, silverleaf being particularly abundant. Twelve months after (June, 1922), a most remarkable improvement was seen. On each of the three plots to which lime had been applied there was a very dense growth of clovers (red, alsike, and white) and grasses, the former being then fully a foot high. The whole was so dense that it was only by separating it and thus getting to the bottom that any weeds could be found and they were then seen to be diminutive and weak. On that part which had received no lime there was an abundance of sheep's sorrel—the most conspicuous weed—silverleaf, and spurrey, with a very thin covering of grass and clovers, the latter evidently badly nourished.

The differences in the appearance of the two portions of the field were very striking, and could be plainly seen at a distance of two miles! Of the three limed plots the herbage of that which had received sea-sand was quite equal in every way (in some respects rather superior) to that of the other two.

The cost of the lime applied was as follows:—

No. 1. Four tons of sea-sand at 8/-	..	..	= £1 12 0
No. 2. Two tons of ground limestone at 35/-	..	..	= £3 10 0
No. 3. Half a ton of ground lime at 66/-	..	..	= £1 13 0

These prices include in the case of the sea-sand carriage to the farm-yard, but with the lime and limestone, carriage to the nearest railway station. Although the cost of the sea-sand and that of the ground lime are almost identical it must be remembered that equivalent amounts were not used and that the effect of 4 tons of sea-sand may reasonably be expected to outlast that of 10 cwt. of ground lime: in fact appearances seem to indicate already that this is so.

Farmers' Opinions.—The testimony of farmers in all parts of the county as to the value of sea-sand is available and the opinions of a few may be given. A dairy farmer near St. Ives, writing on 17th June of this year, says, "We have 8½ acres of hay ('seeds') of which we manured 3 acres with 7½ cwt. of superphosphate mixed with an equal quantity of sea-sand and we have the finest crop I have seen in this district. The ½ acre left had better treatment previously, but one could tell to a foot where the mixture of sand and superphosphate went." A farmer with a good soil near St. Columb writes: "Sea-sand is being used more freely now than 20 years ago. It is applied at the rate of 4 to 10 tons per acre with artificial manures for turnips and wheat. On land which has been 'sanded' there is usually a better growth of clover, and cattle graze more closely. I applied eight loads per acre on permanent pasture in December, 1920, on a portion of a field. There was no appreciable difference in 1921 but in 1922 cattle showed a preference for the sanded portion and are grazing it more closely. The cost is from 4s. to 5s. per cart-load here, brought by traction engine with two trucks carrying about 16 tons."

Farmers who are living near the coast are generally alive to the value of sea-sand. Some, indeed, have used it to excess, but those who live 8 or 10 miles or more from the sea, consider the cost of the labour entailed in carting prohibitive. The latter should remember that the greater the distance the more valuable, generally speaking, this material is, as the land has already received sea-sand in inverse proportion to the miles to be carried.

Most farmers have observed the injurious effect of sea-sand on the oat crop, especially on granite soils, and several state that when "dredge corn" is sown after an application of sea-sand the resulting crop is mainly barley and on the spots where the heaps of sand stood there is frequently no oats at all. This result is doubtless due to the effect of the lime in the sea-sand, for similar effects are seen after the use of burnt lime, although

the majority of farmers believe the sea-sand is more injurious than other forms of lime and the ill effects more lasting. If this is so it is probably because of the large quantities of sea-sand applied.

Mr. Roberts of Rutherford, Wadebridge, sends the following statement with regard to the action of sea-sand on oats, barley and clovers:—

EFFECT OF SEA-SAND.

Field of 14 acres reclaimed from heather, etc.		
2 acres.	5 acres.	7 acres.
<i>Broken in 1908 from heath, etc.</i>		
1915. Oats.	1915. Oats, good crop.	1915. Oats, good crop.
1916. Oats.	1916. Oats, heavy crop.	1916. Oats, heavy crop.
1917. Oats.	1917. Oats, heavy crop.	1917. Oats, heavy crop.
1918. Oats.	1918. Potatoes, fair crop. No sea-sand applied.	1918. Rape, 5 tons sea- sand per acre. Good crop.
1919. Turnips, with 5 tons sea-sand per acre.	1919. Oats, fair crop.	1919. Oats, fair crop.
1920. White Oats.	1920. Oats, good crop.	1920. Oats, good crop.
1921. Oats and Barley, with "seeds."	1921. Oats and Barley, with grass and clover seeds.	1921. Oats and Barley, with grass and clover seeds.
No oats. Good barley and clover.	No barley or clover grew. A fair crop of oats.	A fair crop of barley and oats with good clover.

"On the 2-acre piece and the 7-acre piece there is now plenty of clover; on the middle piece (5 acres, no sea-sand) there is absolutely no clover although the mixture of seeds was the same as on the other parts and was drilled across the whole 14 acres."

Although lime has been proved to be injurious to the mangold crop in many places only one farmer out of several interviewed had observed any ill effects from the use of sea-sand. This farmer, a careful observer and recorder of facts, says, "when heavy dressings are applied oats fail and mangolds go off yellow with little leaf. Personally I think this might be counteracted by ploughing deeper and applying some clay and potash. Although the oat crop fails the sea-sand is of great value to the grass, and seeing that dairying is the chief asset the failure of the oat crop once in 10 or 20 years ought not to weigh very much against it." One farmer states that he gets a fine sample of oats from the use of sea-sand.

Nearly everyone has something to say concerning the favourable action of sea-sand on the clovers. Thus one farmer living near Truro says: "I have a field of 3 acres which was sanded 7 years ago, except a small part. The sanded part is now a mass of red clover, the remainder nothing but ryegrass and sorrel." As the red and alsike clovers usually die out in the

second or third year of the life of the pasture a more frequent use of sea-sand (or other form of lime) is desirable. In one district (Roche) where the results of applying sea-sand to a temporary pasture have been particularly striking, there has been a very great increase in the amount carted during the past season.

Of the mechanical effect of the sea-sand one need say but little, as the majority of the soils on the north side of the county watershed are on the light side and consequently the texture is not improved by the addition of such coarse material. In connection with this one must remember the heavy rainfall of the county, averaging not less than 40 in.

The importance of sea-sand to the Cornish farmer lies in the fact that the county is destitute of limestone except for one or two very small patches—remnants perhaps of the bed of White Chalk which probably covered a large part of the county at one time. The soils of the county are generally acid, being very deficient in carbonate of lime, and the whole of the burnt lime and limestone used on the land has to be brought by rail from South Devon or Somerset. The cost of the burning and subsequent carriage makes it very expensive, and thus enhances the value of the sea-sand.

Immense quantities of blown sand are found on many parts of the coast-line of England, as North Devon, Pembroke, Glamorgan, Anglesey, Lancashire, Lincolnshire, Norfolk, Suffolk, etc., and it would, at least, be interesting to compare the composition of some of these with that of the North coast of Cornwall and to ascertain what use, if any, is being made of the sand agriculturally. Such an exchange of ideas and facts could not but be beneficial to all concerned.

* * * * *

FIELD EXPERIMENTS WITH ROCK PHOSPHATES AND BASIC SLAGS,

II.—EFFECT ON THE QUALITY OF HAY AND PASTURE.

G. S. ROBERTSON, D.Sc., F.I.C.

For the first part of this article see the JOURNAL for September, p. 519.

THE most important indirect effect of the application of basic slag to pasture is the great improvement which is brought about in the quality of the hay crop and the feeding value of the pasture. In other words one ton of hay from a slagged plot has a higher feeding value than one ton of hay from an untreated plot, and the feeding value of the herbage on a slagged pasture plot has a considerably higher value than the same weight from a corresponding untreated plot. The Cockle Park experiments have put the increased feeding value in the case of hay from the basic slag plot at 13s. per ton—a figure based on actual feeding trials and on pre-war values.

It is of considerable importance, therefore, when considering the value of the various substitutes for the rapidly disappearing high grade slag to which the Cockle Park results apply, to take into consideration their effect upon the quality of the hay crop, and the pasture herbage. In other words, is the increased crop produced from rock phosphates and the new types of slag accompanied by a corresponding improvement in the quality and feeding value?

With this object in view samples of hay were taken for two seasons at each of the Essex Experimental Stations and a botanical analysis of the crop made. The results from two of the experimental centres which are typical of the results obtained at the other centres are dealt with below.

Martins Hearne.—During the two seasons (1917 and 1918) following the application of the various phosphates the growth of red and white clover rapidly spread over the treated plots until in 1918 it was to the eye the dominant constituent of the herbage. As far as the eye could judge the advantage in this respect was with the high soluble slag in 1917 and with the rock phosphates, and particularly Gafsa rock phosphate, during the 1918 season (see Fig. 3). During the dry season of 1919 the clover on the phosphate plots as well as on the untreated failed to make an appearance. The phosphate plots were nevertheless always dis-

tinguishable from the untreated by their brighter and healthier colour and by the double crop of hay which they carried. Samples of hay were collected from each plot, and the results are set out in Table 1 and illustrated Fig. 6.

TABLE 1.—BOTANICAL COMPOSITION OF THE HAY BY WEIGHT
AT MARTINS HEARNE FARM.

Soil: Boulder Clay. Manures sown: 28th February, 1917.

Sample taken: 9th July, 1919.

	Plot 1. Open Hearth (Fluor- spar)	Plot 2. Open Hearth High Sol. Basic Slag.	Plot 3. No Manure.	Plot 4. Gafsa Rock Phos- phate.	Plot 5. Egyptian Rock Phos- phate.	Plot 6. Algerian Rock Phos- phate.
Clovers	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
Clovers	trace	trace	trace	trace	trace	trace
Grasses	85·2	88·1	58·5	82·6	96·7	95·8
Weeds	14·8	11·9	41·5	17·4	3·3	4·2

COMPOSITION OF THE GRASSES BY WEIGHT.

Lolium perenne ...	9·9	22·0	6·8	26·9	19·8	17·0
Pleum pratense ...	6·0	7·7	2·8	4·5	5·7	1·9
Cynosurus cristatus ...	20·6	14·7	10·8	25·2	28·7	10·6
Poa trivialis ...	1·3	12·0	0·6	10·9	7·3	9·5
Avena flavaescens ...	1·3	1·4	0·6	1·0	1·3	0·6
Festuca ovina ...	—	0·9	—	—	—	—
Holcus lanatus ...	32·5	29·7	44·3	18·0	17·0	29·0
Agrostis alba ...	0·7	2·6	6·8	4·5	4·8	11·2
Anthoxanthum odoratum	27·7	5·0	27·3	9·0	15·4	20·2
	100·0	100·0	100·0	100·0	100·0	100·0
Superior grasses ...	39·1	58·7	21·6	68·5	62·8	39·6
Inferior grasses ...	60·9	41·3	78·4	31·5	37·2	60·1

It is evident from the results that the action of the various phosphates has not been confined to the clover. They have had a very marked effect on the development of the grasses. The extent of the action is best shown by grouping the grasses into good or superior grasses and bad or inferior grasses, including in the latter category Yorkshire Fog (*Holcus lanatus*), Bent Grass (*Agrostis alba*) and Sweet Vernal Grass (*Anthoxanthum odoratum*). It will be seen from Table 1 and Fig. 6 that the High Soluble Slag, Gafsa rock phosphate, and Egyptian phosphate have given precisely similar results. Algerian phosphate does not seem to have been quite so good as the others, whilst the open hearth low soluble fluorspar slag, although it has produced a marked improvement, is nevertheless not so effective as the other phosphates.

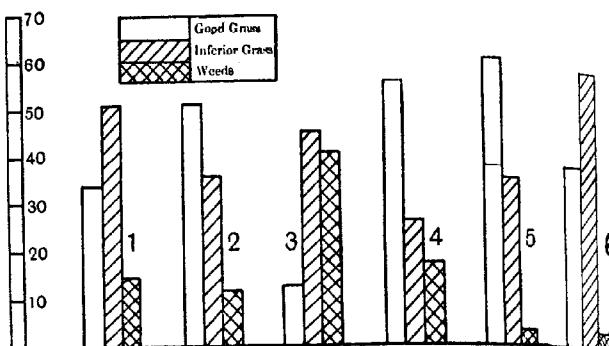


FIG. 6.—Botanical Composition of Hay by weight at Martin's Hearne, 1919.

1. Open hearth (fluorspar basic slag). 2. Open hearth (high soluble) basic slag. 3. Untreated. 4. Gafsa rock phosphate. 5. Egyptian rock phosphate. 6. Algerian rock phosphate.

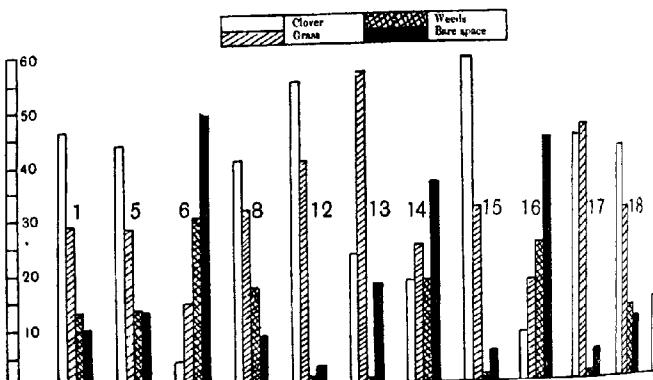


FIG. 7.—Percentage of Ground Space occupied by the Vegetation at Horndon, August, 1919.

1. Florida pebble phosphate. 5. Open hearth (high soluble) basic slag. 6. Untreated. 8. Gafsa phosphate. 12. Egyptian phosphate. 13. Superphosphate, heavy dressing. 14. Superphosphate, light dressing. 15. Superphosphate and lime. 16. Untreated. 17. Open hearth (high soluble) basic slag. 18. Open hearth (fluorspar) basic slag. C. Lime.

During the more favourable season of 1920 clover again made good growth on the phosphate plots and bulked largely in the good hay crop. There was quite as much present on the rock phosphate plots as on the high soluble slag plot. Only a partial analysis of the hay from three of the plots was made. The figures are given in Table 2.

TABLE 2.—BOTANICAL COMPOSITION OF THE HAY BY WEIGHT
AT MARTINS HEARNE.

Sample taken : 9th August, 1920.

	Plot 2. Basic Slag. High Soluble.	Plot 3. Untreated.	Plot 4. Gafsa Rock Phosphate.
	per cent.	per cent.	per cent.
Clover	... ... 27·5	11·2	35·0
Grasses	... ... 63·0	58·5	51·2
Weeds	... ... 9·5	30·3	10·8

Horndon.—Samples of hay from the plots at this centre were taken in 1920 and a partial analysis was made.

It was quite evident from the figures that the various basic slags and rock phosphates bring about the same type of improvement, and there is nothing to choose between them in their effectiveness in this respect. It is thus reasonable to assume that the quality or feeding value of the hay produced from each must be similar.

Effect of Various Phosphates on the Pasture Herbage.—It is not possible at Horndon to cut the plots for hay in successive years. It is essential to alternate with grazing in order to establish a close bottom which will in the succeeding year, when the meadow is reserved for hay, protect the surface from the direct rays of the sun, keep the soil cool and thereby retain moisture and so enable the crop to grow. During 1919 the plots at Horndon were grazed by cattle and sheep. The contrast between the various plots was so striking that at the suggestion of Sir John Russell an endeavour was made to determine the percentage of the ground space occupied by the various species. In making the determination the method recommended by Armstrong* was followed. The results are set out in Table 3 and illustrated in Fig. 7.

Four interesting points emerge from the results:—

(1) The various basic phosphates, whether rock phosphates, high or low soluble slags, or basic superphosphate (superphosphate and lime), bring about exactly the same type of improvement in the pasture and they are equally effective in this respect.

(2) It is quite evident, if the results in Table 3 are compared with the weights of hay in the same plots in the succeeding year, that it is impossible to judge of the relative value of the various phosphates as regards yields of hay by an inspection of

* *Journal of Agricultural Science*, Vol. II, p. 283.

the pasture. A very effective illustration of this point is given by a comparison of Plots 17 and 18. As far as quality goes they are identical and examined in the grazed condition there is little to choose between them. When, however, the plots were reserved for hay and the crop weighed, Plot 17 produced a crop of 28.8 cwt. per acre and Plot 18, 16.8 cwt.

(3) The reason for the less satisfactory results from superphosphate on pastures where the chalk reserve is low or absent is apparent. Superphosphate alone (Plot 13) does not stimulate the growth of clovers to the same extent as the basic phosphates—it tells mostly on the grasses. Where lime is present or is added as on Plot 15, producing a "basic superphosphate," the clover is stimulated to an even greater extent than on the other basic phosphate plots.

(4) Lime alone is ineffective on this type of soil. The improvement in the quality of the crop is small and there is no increase in the crop yield.

Fig. 8, 9, and 10 which show turfs from the high soluble slag plot, the untreated, and the Gafsa phosphate plot, give some idea of the contrast which met the eye when walking over the plots.

TABLE 3.—PERCENTAGE OF GROUND SPACE OCCUPIED BY THE

VEGETATION ON THE PLOTS AT HORNDON.

Manures sown : 28th February, 1918; Analysis made :
August, 1919.

Plot	Manure (Dressing 200 lb. Phosphoric Acid per acre)	Clover		Grass		Weeds		Rare Space	
		percent.	percent.	percent.	percent.	percent.	percent.	percent.	percent.
C	Lime alone	15.1	31.6	39.0	20.3				
1	Florida pebble phosphate	46.0	30.6	13.3	10.1				
3	Algerian	47.4	30.1	7.4	15.1				
5	Open Hearth high sol. basic slag	44.1	28.6	13.7	13.6				
6	Untreated	4.2	11.8	31.0	50.0				
8	Gafsa phosphate	41.3	32.3	57.6	8.8				
9	Tunisian phosphate	38.5	36.9	21.0	3.6				
12	Egyptian phosphate	55.5	41.0	10.7	2.8				
13	Superphosphate (200 lb. P ₂ O ₅ per acre)	23.9	57.3	0.7	18.1				
14	Superphosphate (50 " for 13)	18.8	25.3	18.8	37.1				
15	Superphosphate plus 1 ton (as for 13) of lime per acre	60.0	32.7	1.4	5.9				
16	Untreated	9.4	19.1	26.0	45.5				
17	Open Hearth high sol. basic slag (same as for Plot 5)	46.2	47.2	1.4	5.2				
18	Open Hearth (Fluorspar) basic slag (low soluble)	43.8	31.8	13.3	18.0				
H	Cleveland phosphate	43.1	33.3	5.6					

Conclusions.—Rock phosphates produce exactly the same type of improvement in the quality of the hay crop and the



FIG. 8.—Turf from Basic Slag (high soluble) Plot at Horndon, August, 1919.

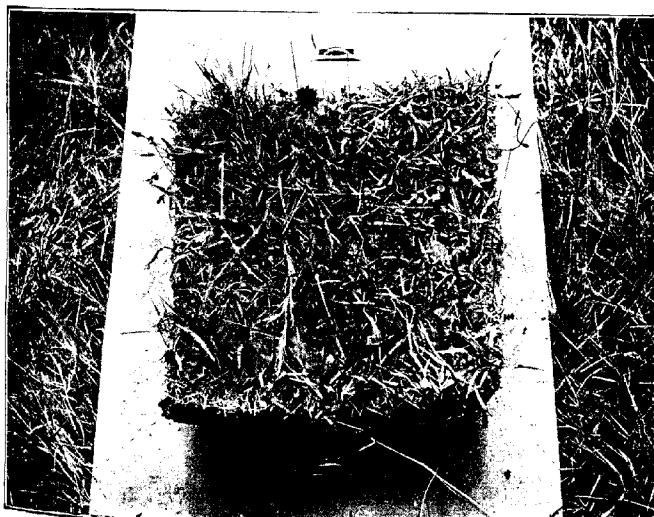


FIG. 9.—Turf from untreated Plot at Horndon, August, 1919.



FIG. 10.—Turf from Gafsa Rock Phosphate plot at Hornden, August, 1919.



FIG. 11.—Standard Chip Baskets, sizes 3 and 4. Nos. 4 to 19 inclusive in order of capacity
reading from left to right and downwards

pasture as the most soluble types of open hearth basic slag, and they are quite as effective in this respect.

The open hearth low-soluble fluorspar slags are not so consistent in their behaviour. The evidence suggests that the less soluble types do not improve the hay crop to the same extent as the high-soluble slags.

The action of phosphates on grass land is not confined to developing the clovers. They have a very decided effect in improving the quality of the grasses. The evidence available does not agree with Middleton's suggestion* that the improvement of the grasses is due to the collection of nitrogen by the clover plant. It is more likely to be due to the grasses benefiting by the direct fertilising effect of the phosphates or to the phosphates having some action on the production of nitrates in the soil, or to the operation of both these causes.

* * * * *

STANDARDISATION OF CHIP BASKETS.

J. STODDART,

Ministry of Agriculture and Fisheries.

ONE of the most striking features observed when visiting the chief distributing markets this summer was the heterogeneous collection of packages and baskets used in marketing the soft fruit crop. In no other industry is there shown such a complete disregard of the essential needs of standardisation as affecting economic distribution. As might be expected, enquiry amongst producers and distributors concerning this condition reveals an extraordinary lack of unanimity of opinion except that some kind of reform is needed. The position in regard to non-returnables, particularly the baskets used for strawberries and popularly known as "chips" is most noticeable, possibly because, at first sight, they appear to be easily amenable to standardisation.

In spite of the general desire for reform a state of inaction persisted, possibly because those concerned were waiting for someone to give a lead. The Ministry of Agriculture arranged in 1920 for a full investigation into the need for and the means whereby fruit packages could be standardised, and the result of this investigation clearly showed that distribution of fruit

**Journal of Agricultural Science*, Vol. I, p. 131.

[Oct.,]

would be facilitated and possibly cheapened if the use of packages were limited to those which had been standardised. Soon after an agreement was reached as to the standardisation of the apple box, and a public Conference was called at the Imperial Fruit Show of 1921 to consider the possible standardisation of other packages. At the Conference it was generally agreed that standardisation was necessary, but that more investigation was necessary before the actual details could be settled. During the early part of the present season, therefore, a further investigation was made to obtain sufficient data to permit of the settlement of definite standards. The collection of these data was done by the writer and the following gives a brief outline of the investigation.

To ascertain the exact position, specimens of chips at present in use were obtained and a determination made of their capacity, with the results shown in the following table:—

Sample Number.	Cubic capacity, in inches, level with top of basket,	Sample Number.	Cubic capacity, in inches, level with top of basket,
<i>Makers, No. 2 Size</i>			<i>Makers, No. 4 Size</i>
1	... ... 130	13	... ... 211
2	... ... 132	14	... ... 227
3	... ... 144	15	... ... 237
<i>No. 3 Size</i>			16 239
4	... ... 160	17	... ... 244
5	... ... 175	18	... ... 245
6	... ... 181	19	... ... 245
7	... ... 185	<i>No. 6 Size</i>	
8	... ... 189	20	... ... 343
9	... ... 193	21	... ... 365
10	... ... 203	22	... ... 385
11	... ... 215		
12	... ... 215		

The capacity was ascertained by filling each chip with haricot beans, the true cubic capacity of which was then determined by weight (allowing that 1 oz. beans had a capacity of 2.03 cu. in.). In every instance the beans were shaken down to secure consistent settlement and means were provided to prevent distortion of the package from the normal. By this method the capacity can be obtained with a margin of error probably not exceeding more than 2 per cent. The illustration shows the chips of sizes 3 and 4 that were tested.

The measurement of baskets with fruit would have been more difficult, for the weight capacity of any one basket of soft fruit, and particularly strawberries, varies with the season,

the variety grown, and size of berry. In the present investigation attention was mainly directed towards ascertaining the necessary cubic capacity of a basket for packing 3 lb., 4 lb., and 6 lb. of the more common varieties of strawberries, and the actual space occupied by, say, 1 lb. of strawberries. For these investigations the sample baskets Nos. 4 to 22 were used and filled with fresh berries of the Royal Sovereign strawberry picked in the middle of the season. As a result of many tests it would appear that 1 lb. of strawberries actually occupied a space of some 58 cu. in.

As strawberries, however, vary considerably in size and must not be pressed in the basket, it is obviously impossible always to pack the same weight in a constant capacity or to allow only 58 cu. in. for each lb.; furthermore, it is necessary to leave space so that fruit will travel with less risk of injury. The package then requires to be $\frac{1}{2}$ in. in height over and above the capacity actually occupied by the fruit. A short review of the table would show that samples No. 1, 2 and 3 are made to carry 2 lb. of strawberries, though No. 3 is unnecessarily large. The 2 lb. chip, however, is not favoured by railway companies on account of its small size. The experience of many growers and distributors shows that there is a real need for a package holding small quantities of strawberries suitable for sale intact by retail and that berries so packed realise higher prices than when packed 3 lb. or 4 lb., in support of which one might refer to the development in the Tamar Valley of the non-returnable crates holding 54 punnets, each containing $\frac{1}{2}$ lb. fruit; and of the chip containers holding eight 1 lb. punnets in use in the Swanwick area.

The nine samples numbered 4 to 12 and sent out by the makers for packing 3 lb. of strawberries have capacities varying between 160 and 215 cu. in., the difference between the largest and smallest being 55 cu. in. The basket No. 4 cannot possibly hold 3 lb. of freshly picked strawberries. No. 5 is too small for 3 lb. of large but might take 3 lb. of small berries. No. 6 carries 3 lb. if the centre is raised to the level of the top but would be too small for 3 lb. lighter weight berries than Royal Sovereign. No. 7 has a slightly larger margin, which is further increased in Nos. 8 and 9. No. 10 is of sufficient capacity to hold 3 lb. of almost any variety of berry well below the level of the top. Nos. 11 and 12 are unnecessarily large. The figures would indicate that a working standard for strawberries can be fixed between 190 cu. in. and 200 cu. in.

At times these baskets are used for packing gooseberries, currants and cherries, when a capacity of 200 cu. in. is required to pack 4 lb. of fruit packed level with the top; so that if the standard chip is to carry 4 lb. of these fruit 200 cu. in. should be adopted. For general use, however, it would be more economical to pack strawberries in a basket allowing 190 cu. in. for the 3 lb. chip.

The seven baskets numbered 13 to 19, have capacities varying from 211 cu. in. to 245 cu. in. No. 13 is too small and has in fact a less capacity than the largest of the No. 3 size. No. 14 is a little too small; Nos. 15 and 16 are correct for the bulk of the crop; and Nos. 17, 18 and 19 have an ample margin for all except the lightest weight berries. Generally, however, a capacity of 245-250 cu. in. would be sufficient to allow for the 4 lb. chip and a basket of this size would also carry 5 lb. of gooseberries, currants or cherries.

Apart from the capacity the variation of dimensions is a matter calling for consideration. For economic stacking and transport the ideal chip is one in which the length is approximately twice the width with a depth slightly less than the bottom width. The adoption of uniform dimensions based on the proportions given would benefit all concerned in transit and distribution. The following tentative dimensions are offered for consideration:—

No. 3 size, inside measure—

Top	11 $\frac{1}{4}$ in. x 5 $\frac{1}{2}$ in.	{	3 $\frac{5}{8}$ in. deep for 190 cu. in.
Bottom	10 in. x 4 $\frac{1}{2}$ in.		3 $\frac{3}{4}$ " " 200 "

No. 4 size, inside measure—

Top	12 in. x 6 in.	{	3 $\frac{7}{8}$ in. deep for 240 cu. in.
Bottom	10 $\frac{3}{4}$ in. x 5 in.		4 " " 250 "

Strength is not less important than capacity and dimensions, and it is to be regretted that many of the chips at present in use are too flimsy to afford adequate protection to the contents.

FARM INSTITUTES.

PART III.

This article concludes the summary of the training provided at the Farm Institutes which have been established in this country. The two previous articles, dealing with eight of the Institutes, appeared in the August and September issues of the JOURNAL. The account below refers to the Institutes established in Hertfordshire, Staffordshire, Monmouthshire and Carnarvonshire.

HERTFORDSHIRE AGRICULTURAL INSTITUTE.—

The Oaklands Park Estate of 335 acres, comprising a mansion house, offices, gardens and grounds, and the home farm, was acquired by the Hertfordshire County Council in 1919 for the purposes of a residential Farm Institute. The Institute is situated 2 miles from St. Albans, is fitted up with a recreation room, laboratory, lecture room, library and museum, and has accommodation for 30 resident students (20 male and 10 female). Mr. J. B. Hunter-Smith, B.Sc., is Principal of the Institute and Agricultural Organiser for the County.

Instruction is provided for pupils of both sexes in the science and practice of agriculture, dairying and horticulture. The instruction aims at showing students how to make a living out of farming. Residential students are required under proper supervision to take part in all seasonal work on the farm, with the stock, or in the dairy or gardens. Trials are conducted with different crops, manures and methods of cultivation, and an endeavour is made to test different systems of farming. Experiments and demonstrations on economic lines are also arranged at various centres in the county. Detailed records are kept of the production and cost of crops, meat, milk, etc., the results and statistics being published.

Lectures and short courses of instruction for farmers and farmers' sons are held at the Institute and at suitable centres in the county. These are supplemented by demonstrations and advisory visits.

The Farm.—The farm consists of about 300 acres of typical Hertfordshire land, of which 160 acres are arable, 100 acres grass, and the rest woodlands and gardens. A herd of 20 Dairy Shorthorns is maintained and the live stock also includes two breeds of pedigree pigs and ewes for crossing for early lamb production. A special feature will be made of baby beef production. The farm equipment includes a silo.

A large reconstructed building provides ideal accommodation for all dairy work. Special attention will be given to clean milk production (including bottling and marketing) and soft cheese-making. An area of nearly 4 acres is available for a horticultural department, and the gardens, to which an apiary is attached, comprise 1 $\frac{3}{4}$ acres. They provide scope for practical instruction in market gardening, fruit culture, tomato growing, and floriculture, and will be run on commercial lines. In the spring of this year a poultry department was started, and this is now being extended.

Courses of Instruction.—The main agricultural course is arranged in three 12-week terms covering a complete farming year, from October to August, and students are recommended to attend for the whole year in order to become conversant with the different aspects of farming practice. This course is designed for young men who intend to become farmers, bailiffs, or estate-agents, and has for its aim the training of the eye and hand along with the intelligence.

A one-year course in dairying is run concurrently with the foregoing for students wishing to take the British Dairy Farmers' Association's certificates in butter and cheese-making. This course also fulfils the regulations as to practical experience required as a preliminary for the examinations for the National Diploma in dairying.

There are also short courses in agriculture, dairying, horticulture, poultry-keeping, and bee-keeping. The 4-weeks course in agriculture is for non-residential students, and is limited to young men of 17 years or over who have had at least one year's farming experience. Lectures are given daily during 3 weeks in the winter, and one week in the summer is devoted to farm demonstrations and visits to prominent farms and experiment stations in the neighbourhood.

Entrance scholarships are awarded annually as the result of examination; one agricultural scholarship will be awarded to a student intending to continue his studies at an Agricultural College, and one enabling the holder to take a degree course in agriculture at Cambridge University. Certificates are awarded to all students who reach a satisfactory standard in the examination held at the end of the third term.

Experiment and Research.—The Institute maintains direct touch with the farmer and is equipped to carry out investigations of practical and commercial value. Examples of this type of work at present being done are (*a*) an investigation into the



FIG. 1.—Hertfordshire Agricultural Institute, Oaklands, St. Albans.



FIG. 2. -Non-pedigree Shorthorn Heifers at Oaklands.



FIG. 3.—Staffordshire County Farm Institute, Rodbaston, Pinkridge.

effects over a rotation of different methods of cultivation, (b) field trials of various methods of sowing cereals, (c) field trials to ascertain the most profitable crops for silage, (d) feeding experiments with silage and roots, (e) commercial pig feeding experiments, and (f) comparison of various crosses for early lamb production. Work of this description is undertaken because it is of immediate commercial value to the farmer. Every effort is being made to extend these investigations in other useful directions.

STAFFORDSHIRE COUNTY FARM INSTITUTE.—

Rodbaston Estate lies (at Rodbaston, Penkridge) in the centre of an important agricultural district and midway between the towns of Wolverhampton and Stafford. The Hall has been adapted for residential and instructional purposes and will accommodate 25 students. It is situated in beautiful grounds away from the main road. The Principal of the Institute and Agricultural Organiser for the County is Mr. J. C. Rushton. A drastic modification of the original buildings planned for the Institute was made necessary by the economic crisis that followed the War, and some of the buildings at Rodbaston are but make-shift in character pending an improvement in the financial situation.

The Farm.—The farm is 315 acres in extent, about one-third being arable. The soil is chiefly of medium loam overlying the new red sandstone, but there are some patches of peaty and of sandy soils. The stock kept on the farm is essentially of a commercial type. A recorded herd of Dairy Shorthorn cattle is being built up: a first-class Dairy Shorthorn bull is kept and the calves are reared. There is a small flock of sheep, and also pigs, comprising pure bred Large Whites and Gloucester Old Spots, the herd being kept largely on the open-air system. At present the horses are kept for ordinary farm purposes but it is intended to raise a registered shire stud. The farm is well equipped with modern machinery, a motor tractor is used for threshing and cultural operations, and gas and petrol engines are used to work the ordinary farm machinery.

Courses of Instruction.—The year's work at the Institute is divided into two sessions. From October to March there is a course for young men in general agriculture. The first part of this course deals with soils, manures and crops from the farming point of view. The requisite instruction in chemistry and botany is provided in other sets of lectures and laboratory work. The

second part concerns live stock, especially the breeds and management of horses, cattle, sheep, and pigs, and the principles and practice of feeding all classes of stock. A special feature of this part of the course is stock judging.

During the summer, the Institute has been available for women students, 25 of whom have been in residence, taking short courses in dairying, poultry-keeping, horticulture, and bee-keeping. The course was extended for a further six weeks to enable students to obtain further instruction in cheese-making.

Throughout all the courses a large proportion of the time is occupied in ordinary practical operations affecting each subject of instruction, and every student is expected to take part in the work.

Certain scholarships and maintenance grants are offered for competition.

MONMOUTHSHIRE AGRICULTURAL INSTITUTION,

USK.—The Monmouthshire Agricultural Institution at Usk was established in 1913 under a Scheme of the Board of Education under the Charitable Trusts Act, and is under the control of a Governing Body consisting of 18 representative Governors and 2 co-opted Governors, 10 of the representative Governors being appointed by the County Council. Up to the present the Institution has been independent of the Local Education Authority and has been maintained out of Trust funds, no grant being made in aid of its work either by the Ministry or the Local Authority.

Mr. J. C. Newsham, F.L.S., formerly Principal of the Hampshire Farm Institute, has occupied the post of Principal of the Institution since its establishment.

The Farm.—The Governors were fortunate in purchasing a mixed farm of nearly 300 acres from the Marquis of Bute. The Farm is not only geographically central in the county, but also affords typical examples of the farming of the district. It is cropped largely on intensive lines, and although the greater portion of the land is of a light loamy character, there are also heavy and medium soils which provide variety in the systems of cultivation. There are hill pastures, moreover, in addition to the meadow land along the valley of the Usk.

New farm buildings were completed in 1917 and now embody the latest improvements for effecting economy in the housing and feeding of live stock, while suitable provision is made for carrying out feeding experiments. The block of buildings includes a well-equipped milking shippion, covered yards, calf pens,

horse stables and barns. The last named are provided with the necessary modern machinery for the chaffing, pulping, grinding and preparation of foodstuffs. The piggeries, Dutch barn, and implement sheds are all detached from the main block of buildings, as is also the dairy.

The live stock includes a herd of pedigree and non-pedigree Dairy Shorthorns, Hereford cattle for fattening, a small pure-bred flock of Oxford Down sheep, and several Shire mares for breeding. Of pigs, pure-bred Large Whites, Large Blacks, Middle Whites and Berkshires are kept, and these are largely used for crossing purposes. Demonstrations in the feeding of cattle, calf-rearing, pig-feeding and breeding are undertaken, while on the farm, trials of varieties of grain, root, and forage crops are carried out from time to time, and also manurial trials and the testing of new practices.

Horticulture is a special feature of the Institution's work, sixteen acres of land having been set aside for the cultivation of hardy fruit, vegetables and florist flowers, the ground being intensively cropped for commercial market-gardening on the most improved system. This department serves the dual purpose of providing instruction for students, and a demonstration centre for the more intensive methods of cultivation, and the testing of new varieties. The demand for fruit and vegetables is considerable throughout the large industrial areas of South Wales, and the establishment of this department at Usk should do much to stimulate market-gardening throughout the county, as much of the land on the eastern side is very suitable for both fruit and vegetable growing.

The Dairy is provided with the necessary appliances for dealing with the whole of the milk supply from the dairy herd of some thirty cows. Practice is given in the manufacture of the commoner varieties of hard and soft cheeses, the management of milk and cream, milk testing, milk recording, elementary dairy chemistry, butter-making, and dairy management generally. The production of clean milk from the practical dairy farmer's standpoint is also demonstrated.

Poultry-keeping is practised on the semi-intensive system, four acres of land having been allotted to this department. It is well equipped with the necessary buildings, including suitable brooder and laying houses, and Mammoth and smaller incubators. The students are taught to make many of the principal poultry appliances themselves, this work being largely engaged in during the winter months. Of breeds of poultry, White

Wyandotte and White Leghorn are kept specially for egg production, while other breeds include Ancona, Rhode Island Red, Light Sussex, and Indian Game, considerable trade being done both with sittings of eggs and day-old chicks. Of other poultry, Khaki Campbell ducks and Toulouse geese are kept at present.

Courses of Instruction.—The average age of the students is about seventeen years, and those taking general agriculture come usually for one year or two years, a certificate and diploma, respectively, being awarded to those who pass their examinations satisfactorily at the end of one or two years. Shorter courses are also arranged, the Institution year beginning in October and consisting of two terms each of 22 weeks' duration. Students may also specialise in any of the other departments of horticulture, dairying, or poultry-keeping.

Considerable attention is given to instruction in all manual processes so that students may be better able to understand the application of science to practice with no doubts left in their minds as to the reason for any particular operation. It is not considered that very elaborate or costly class-rooms are essential, as there is no class-room instruction equivalent to that which can be given in the open fields, cowsheds, stables and workshops.

Owing to the postponement of the erection of the residential portion of the Institution buildings, it became necessary to acquire accommodation for students in the form of hostels. The boy students are housed in a commodious and pleasantly situated house on the banks of the Usk, within easy distance of the farm, while the girls are accommodated in the farm house, a matron being in charge of each hostel.

Periodical visits are paid to the Institution by parties of farmers, young farmers' clubs, and various associations of gardeners, allotment holders and poultry keepers, and these afford opportunities for useful and practical discussions. Numerous technical inquiries are dealt with by the staff. Small holders, in particular, regard the Institution as a place to which they can look for assistance and advice in all matters relating to their work. While, however, the Institution is the centre of a great deal of the county's agricultural activities, it has so far, as already stated, been conducted independently of the Local Education Authority, which employs its own County Agricultural Staff. The question of utilising the School and farm in connection with the general work of agricultural education in the county has recently been under consideration, and the Governors and the

County Council have decided to apply to the Board of Education for an amending scheme under which it is proposed that the control of the Institution shall be transferred to the County Council. It is contemplated that the Institution shall then become the centre for all agricultural education conducted under the Council and be recognised by the Ministry of Agriculture as a Farm Institute for the county.

MADRYN CASTLE FARM SCHOOL.—The Carnarvon County Council was the first Council in England and Wales to establish a Farm School under the Development Fund Regulations, the Madryn School being opened in 1913. The Council took active steps in the formation of small holdings under the Act of 1908, and felt that it was a condition of the real success of the movement that it should be supplemented by a well organised and comprehensive scheme of rural and agricultural education. Moreover, they were alive to the need for disseminating modern ideas of farming amongst the agricultural community of the Lleyn Peninsula, and for giving instruction in improved methods of cultivation. When therefore in October, 1910, the Madryn Estate, extending to an area of about 2,239 acres, and comprising a mansion together with extensive out-buildings and a walled garden, was acquired for small holdings, it was decided to convert the Castle into a farm school and to farm the adjacent land as a demonstration holding.

The School, which is about 7 miles from Pwllheli—the nearest railway station—is situated in the heart of the Lleyn Peninsula, an extensive agricultural district containing an exceptionally large percentage of small holdings.

The mansion is ancient and historic and appeals strongly to local sentiment, as it was, previous to its acquisition by the County Council, the home of the family of Love Jones Parry, who was descended from the North Wales princes, and was the hero of the political revolution of 1689. It has been adapted for teaching and residential purposes, and contains accommodation for the resident staff and 30 students.

The Farm.—The farm is about 200 acres in extent, of which 170 acres are arable and meadow land. The soil, which is loamy in character, is well adapted for the growth of most of the ordinary farm crops.

The farm is managed as a mixed holding. The native breed of Welsh Black cattle is kept and a herd of about 14 dairy cows is maintained. The majority of the calves are reared. Field experiments are conducted in connection with varieties of potatoes,

[Oct.,

seeds mixtures and crossing of sheep, as well as demonstrations relating to fruit trees planted on grass.

Courses of Instruction.—A winter course lasting for 20 weeks from October to March is designed for farmers' sons and others who propose taking up farming. The theoretical teaching consists of lectures on soils, manures, crops, live stock, farm implements and machinery, veterinary science and land surveying. This work is supplemented by demonstrations and practical work on the farm. Students attending this course have ample opportunities of learning all the more important operations obtaining on a mixed farm, and the feeding and general management of live stock.

A summer course in dairying and allied subjects, extending over 12 weeks (May-July), is primarily arranged to meet the requirements of farmers' daughters. Modern methods of handling milk and dairy produce are taught. Butter-making and the manufacture of ordinary hard and soft cheeses form an essential part of this course, which includes also instruction in poultry-keeping and bee-keeping.

Arrangements are made by which students attending either of the above courses can receive instruction in practical gardening. The garden attached to the School is over 4 acres in extent, and is well stocked with fruit trees. Market gardening is a special feature of the work.

A course in school gardening and rural science for elementary school teachers is also arranged when necessary during the midsummer holidays. Much importance is attached to these classes by the Local Authority, as it is realised that it is only through the teacher that a proper "atmosphere" for agricultural education can be created amongst the rising generation.

The poultry department consists of about 300 head of the leading breeds of poultry. A large number of ducks and a flock of geese are also kept. Artificial and natural hatching are carried on and the selling of day-old chicks and sittings of eggs forms an important part of the activities of this department.

The dairy is equipped with modern apparatus and opportunities are thus afforded to train students in the most modern methods in the management of milk. Milk recording and milk testing receive special attention.

Theoretical and practical instruction is also given in apiculture. Carniolian, Italian and hybrid swarms are kept, and the apiary consists of about 20 hives.

A limited number of entrance scholarships are awarded to pupils from Carnarvonshire who propose attending courses at the school, and also leaving scholarships on the result of an examination held at the end of each course, to enable pupils to proceed to one of the University Colleges, or to some recognised centre for advanced dairy instruction.

* * * * *

A VILLAGE HISTORY EXHIBITION AS AN EDUCATIONAL FACTOR: AN EXAMPLE FROM THE WEALD OF KENT.

GUY EWING, J.P., F.S.I.,
Member of the Kent C.C.

THE unit of national patriotism is surely the parish. The parish, the county, the country—these are the steps. This is clearly recognized by the promoters of one great movement which is directed solely to the improvement of the conditions of country life. The Village Clubs Association, already a great organization in this country, and one recently and eagerly copied by the French, realizes that the village is a self-contained unit of the countryside, and, better still, it realizes that while the villagers want clubs, they want clubs like gentlemen's clubs, where the members elect their own committees and frame their own rules, where they trust one another to behave properly and deal with offenders themselves. A club, under the Association's constitution is to be a headquarters for all village activities, and the centre for all schemes of recreation and improvement. Improvement is asked for by the villagers, but it must be tactfully supplied. Lectures suggest high-brows and long words, addresses are suspected as inspired by "causes."

An experiment in what is, at any rate in Kent, a new line has recently been tried, which seems to have been wholly successful. The promoter, forced by years to have a good deal of leisure, occupied himself with a study of the records of an ancient parish in the Weald of Kent. The Registers, dating from 1566, complete with the exception of two years, he transcribed, and a valuable account book of the Parish Officers from 1599 to 1714 he analyzed. Various other documents, including ancient deeds and the admirable publications of the Kent Archaeological Society, yielded much interesting information, incidentally showing that some of the families have been settled in the parish since the

15th century. Then, when the Village Club, which was started in 1921 in affiliation with the Village Clubs Association, was discussing ways and means, being still in debt to the building fund, he suggested a loan exhibition illustrating the parish history. The idea was received politely but without enthusiasm by a committee who did not realize that they had any individual part in their parish history. However, it was agreed to try what was, at any rate, something out of the routine of jumble sales and whist drives.

The promoter got to work, and applied to the big houses first, meeting with sympathy and support, though few realized that they had much to contribute. He then put up a notice in the Village Club asking for the loan of specified articles, or information as to where they could be obtained. This remained up for about six weeks and elicited no single reply of any kind. A letter addressed to four local newspapers may have served as a cheap advertisement for the exhibition, but it only brought one letter. This was from a lady in a neighbouring parish who offered a copy of a small volume of "Poems and Songs" by a village "cordwainer" published by subscription in 1854. This was really one of the foundation stones on which the edifice was built. The local shoemaker-poet had begun his collection with an ode to the parish concerned, full of allusions to families and places. He had also addressed "Recollections" to the village miller with references to his playing of the "Violoncello in the Parish Church." A visit to the grandson of the miller resulted in the loan of the identical instrument and many other articles belonging to former days, such as brand-irons, a sampler, and an old flint-lock fowling-piece. In addition, information was forthcoming about other relics in other houses, and then the list began to grow rapidly. At one time the promoter, in fear lest his exhibition should come to naught, had applied to a local dealer in antiques for the loan of examples of the iron industry for which the parish was famous in the 16th and 17th centuries. He promised to lend whatever was required but ultimately a man-trap was all that was asked of him. An inquiry from a stranger, a famous collector who wanted an extract from the Registers concerning a tradesman who issued tokens in the reign of Charles II, led to a correspondence, and the gift of rubbings of the very few specimens known to exist. Landowners lent fire-backs and fire-dogs, ratchet pot-hooks and other specimens of the work of the local furnace. Ox-yokes, flails, shepherds' crooks, a horn-lantern, waggon bells, sickles, and a variety of

obsolete agricultural implements came from different farm-houses. Flint and steel, tinder-boxes, rush-light holders, one being a rather unusual type formerly in the belfry, needle-work pictures, a horn book, a pair of gloves made in the village 25 years ago when glove-making was a considerable industry there, poke bonnets, smocks, locally known as round frocks, a straw "topper" worn by a cricketer at the end of the 18th century, a wooden trencher, and a pair of scales made out of trenchers, mothering-irons—in fact a great variety of relics and antiquities beginning with flint-implements and ending with the silk flag and stewards' wands of the Benefit Society now defunct—were produced. Flint-lock guns and muzzle-loading volunteers' rifles were lent, and in their own time four working men of the Committee fetched over two miles an ancient cannon, cast for the Army of the Parliament in the village foundry. The pewter Church Plate bought by the churchwardens in 1663 to take the place of that which disappeared at the Reformation came from the rectory. The Parish Registers and account book, referred to above, were shown, as well as a letter from the "Chief in Habitance" of the Parish declining to accommodate any Palatine Refugees in 1709, on the ground that they had more of their own poor than they could "employ" and no "housing to pott them in." This was lent by the Secretary of the Kent Archaeological Society.

A curious old diary, kept by a carrier at the end of the 18th century, threw light on one of the causes of the decay of the iron industry in the Weald. He not only took considerable quantities of guns and shot to Woolwich, but brought back "cole" for the "furnis," owing, no doubt, to the exhaustion of wood fuel.

A pillion saddle and a spinning wheel, both in use little more than a hundred years ago, were curiosities that very few of the villagers had ever seen the like of, though many of their grandmothers used both.

Outside the parish, not many of the families have ever made a name, but one of the Commissioners who tried Charles I came from it, and in later years it has boasted a Lord Justice of Appeal and his son, a well-known London Police Magistrate, a Privy Councillor and University Member, with his brother, a Bishop. Caricatures by Spy and Ape were exhibited of the last four and a large collection of portraits of them and of others, both gentle and simple, was shown.

Paintings, drawings, prints, and photographs illustrated houses in the parish, some of them now no longer standing. The representative of a family, established in the parish since 1510 at least, sent portraits and needlework of the last century but one.

No charge was made for admission, but visitors were invited to make a contribution to the Club funds. It is believed that not one left the building without giving something, while two ladies sent additional donations on the following day to mark the delight that the exhibition had given them. The total result was an addition of about £21 to the funds of the Club, but the real success was the interest shown by all who visited the exhibition. Young men who wandered in with an off-hand listless air soon became absorbed in the things themselves and in the descriptions, written in block letters, that accompanied them. These were sometimes on half-sheets or more of notepaper, with references to families and places from the Parish Records and other sources. It was worth a good deal to see the delighted surprise with which one would draw his fellow's attention to the name of his family or home in an extract from the early records. A popular exhibit was a list of "Early Mention of Present-day names of Places and Families" in the parish. There were over 60 of these, nothing being admitted of later date than the Restoration. Three examples will show what is meant:—

Waystrood or Whey Strood Left by John Still to his son Thomas in 1471. It remained in the Still family till about 1760.

Still - - - Thomas Still was witness to will of Robert Ludwell, 1456.

Ludwells - - - Takes its name from the family of Ludwell mentioned above.

The descriptive labels were, of course, an essential part of the exhibition, and were carefully written to include as many names, still familiar, as possible.

Various circumstances prevented the Club from keeping their exhibition open for longer than one afternoon from two till nine, but next year it is proposed to hold another on a larger scale. This year the exhibits ran into hundreds, but the expected has happened—several have come forward who could have lent things had they realized that what was wanted was common everyday objects of former generations. It is also intended to invite the Education Authorities of neighbouring parishes to bring parties of children to the exhibition, which will remain open for three or four days. Through the winter the promoter hopes to discuss the subject of parish history at the Village Clubs and Women's

Institutes of the countryside. If he succeeds in fanning the spark of local patriotism in only one or two, in showing them that they have traditions of family and parish to live up to, he will not have laboured in vain. Though ostensibly intended as a means for raising money for the Village Club, the promoter hoped all along that the exhibition might have some of the results which it has achieved.

The constitution of the Village Clubs Association adopted by the club in question, a constitution which insists upon freedom from sectarian or party attachment, and from any element of patronage—all of them frequent causes of disaster to similar institutions in the past—greatly assisted in the promotion of the exhibition. Working-men members of the Committee, as related above, fetched the cannon to the village, others helped to bring the trestles and boards from the Nonconformist Church, and set them out, women members of the Committee arranged to supply tea, which, sold at reasonable prices, yielded a profit of about one pound to the Club funds, and, in various ways, all helped and none hindered.

The parish is a purely agricultural one, the population being about 700. In the beginning, probably in the 12th century, it was part of the dense Forest of Anderida, occupied by English swine-herds guarding the pannage-rights of Norman Lords of the Manor, by whom, most probably, the church was built. Gradual clearing of the forest by the swine-herds, as their families grew, brought considerable tracts under the plough, and the clearance of trees felled for fuel for the iron furnaces added more to the area in the 16th and 17th centuries. It is worth noting that the iron industry seems to have been a "foreign" undertaking. The ironmasters were not of the soil, they came from elsewhere and left when the furnaces were closed down. There are no records to show that the natives ever left their agriculture to take part in it. Indeed, so far as the Registers tell us anything, it would seem that those who were brought from the furnace for burial in the churchyard, were strangers. The old families stayed on their land, and their names remain, in some cases, to this day. They grew hops (after their introduction in 1525) and wheat, "pods" and "otes," and continued to do so till the railway came, about forty years ago. This caused a revolution in their agricultural methods, and started a new period in the history of the parish. Thirty miles from London, with a station at their gates, milk production and the lure of ready-money once a month led to a complete change in agriculture and

the disappearance of many old names among the farmers and labourers. There is not one acre under hops in the parish to-day, but many oast-houses, converted into cottages, and many field-names ending in "garden" testify that they were once abundantly grown. Grass has taken the place of arable to a great extent but, once more, the name of the "field" and its furlong measurement show where the Saxon, or, more properly, the Jute, ploughed his acre a day. The population remains fairly stationary, though many of the husbandmen have given place to gentlemen's servants, and the yeomen's houses are converted into "week-end residences with bath-rooms and lounge-halls" as the house-agents have it. In view of such a revolution it is certain that if no record is made to-day of what remains, the chance will be gone for ever in a very few years. By stimulating the interest of the villagers in the history of their families and homes we can do much to help forward the work.

* * * * *

LIVE STOCK AND HORSE BREEDING IMPROVEMENT IN ENGLAND AND WALES.

REPORT FOR THE YEAR 1921-22.

PART II.—LIGHT HORSE BREEDING.

So far as the operation of the Ministry's schemes during the season 1921 is concerned there is little variation to report. The arrangements for the location of stallions were made in conjunction with the new Sub-Committees of the County Agricultural Committees on lines similar to those which obtained when the original County Light Horse Breeding Committees were in existence.

The number of premiums awarded in 1921 was the same as in 1920 except that three additional premiums were awarded for Welsh Cobs, and ten for Welsh Mountain Ponies, while the number of premiums to Riding Ponies was decreased by one. It is interesting to note that although the average number of mares served by the King's and Ministry's Premium stallions combined was the same as in the previous year, the average number for a King's Premium stallion increased by four, whereas the average number for a Ministry's Premium stallion decreased by ten.

With reference to the licensing of stallions under the Horse-breeding Act, 1918, it is of course premature at present to expect any good results to be noticeable from the operation of the Horse Breeding Act, but the Ministry has evidence that owners of licensed stallions no longer suffer as they used to do from the competition of the unsound travelling stallion, whose chief qualification, in the estimation of the careless mare owner, was the cheap fee at which it travelled, and the clearance of such stallions from the road must in course of time secure improvement in the Horse Breeding Industry.

During the travelling season of 1921 the Ministry's Inspectors were instructed to stop stallions they met on the road and to require the production of the licences, and it is satisfactory to be able to report that in only comparatively few instances were the stallions unaccompanied by their licences and only in seven instances were the stallions unlicensed. Failure to comply with Regulations was also reported to the Ministry by the Police, who took proceedings for offences under the Act and in the great majority of cases convictions were obtained.

It is evident from the working of the Act during the second year of its operation that the necessity of having stallions licensed and of the licences being carried by the grooms when leading the stallions is now generally recognised, and the plea of ignorance, which was so common in the first year, was but seldom made during the season of 1921.

Foaling Results for Service Season, 1920.—The foaling percentage of the 60 stallions awarded King's Premiums in 1920, calculated on the returns furnished to the Ministry by mare owners, works out at an average of 49, which is a decrease of three per cent. on the figure for 1919. The highest percentage (67) was obtained by "French Eagle," belonging to the Llawes-y-Coed Stud.

The average foaling percentage of the 26 Board's Premium stallions was 47, as compared with 44 per cent. in 1919.

Earnings of Premium Stallions for Service Season, 1920.—The average amount paid by the Ministry for the 48 King's Premium stallions was £324 and the maximum £404, the corresponding figures for the 12 Super-Premium horses being £455 and £500. The average earnings of the stallions (including the service fees paid by mare owners) were £990 for the King's Premium horses and £582 for the Super-Premium horses, the maximum earnings being £494 and £590 respectively.

The average payments by the Ministry for the Board's Premium stallions was £189 and the maximum £244, the average earnings of the stallions being £252 and the maximum £334.

Service Season, 1921.—The number of mares served by the 60 stallions awarded King's Premiums was 4,350, an average of 72 mares a stallion.

On the recommendation of the Light Horse Breeding Sub-Committees of the County Agricultural Committees, 26 premiums (termed Ministry's Premiums) were awarded, and these stallions served 1,398 mares, an average of 53 mares a stallion.

Five premiums of the approximate value of £145 each were awarded for Riding Pony Stallions. The average number of mares served was 52 and the foaling percentage of the 1920 service season was 53.

Nineteen premiums of the approximate value of £80 each were awarded for Welsh Cob stallions in 1921, and, in addition, three premiums of £80 were awarded for Welsh Roadster stallions in Pembrokeshire.

On the recommendation of the Dales Pony Improvement Society, four premiums of the approximate value of £80 each were awarded to Dales Pony stallions and five premiums of similar value were awarded to Fell Pony stallions selected by the Fell Pony Committee.

Thirty-three premiums were awarded to Mountain Pony stallions in Wales and ten to those in the New Forest. These premiums varied in amount from £5 to £10.

Thoroughbred Show, 1922.—The Show of Thoroughbred stallions in 1922, was held at the Royal Agricultural Hall on 28th February to 2nd March, and the Judges were Sir Gilbert Greenall, Bt., C.V.O., and Lt.-Col. J. McKie, D.S.O. The number of entries was 88 as compared with 97 in 1921 and 106 in 1920. The drop in entries may be attributed to the uncertainty which existed in the minds of exhibitors as to the continuance of the Premium system. Only eight new stallions were exhibited but none of these were of sufficient merit to receive an award.

Fifty-seven King's Premiums (including 12 Super-Premiums) were awarded, and the King's Cup was won for the third year by "Gay Lally" belonging to the Compton Stud, the Reserve horse being "Scarlet Rambler" as in the previous two years.

Pedigree	LICENCE.		REFUSAL.		PERMIT.		THREE-QUARTERS.		HALF-BRED.		HUNTER.		COURTSHIP.		YOUTHFUL.		PONIES.		WELSH.		WELSH GELDINGS.		WELSH QUARTERS.		TOLTS.			
	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused	Licensed	Refused
Pedigree	2,316	266	235	38	—	—	101	161	21	5	7	3	—	—	—	—	172	2	3,418	222	—	—	—	—	—	—	—	
Licensed	167	15	17	3	—	—	10	7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Non-Pedigree	147	14	2	1	80	54	2	2	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Refused	15	3	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	22

Note.—Non-pedigree stallions are arranged as far as possible under types.

The following diseases or defects are prescribed in the Regulations of 1919 for England and Wales, made under the Act, as rendering a stallion unsuitable for the service of mares, namely:—Catarract, roaring, whistling, ringbone (high or low), sidebone, bone-spavin, navicular disease, shivering, stringhalt, and defective genital organs. The Table hereunder gives the number of each breed or type of stallion in respect of which licences have been refused and the diseases or defects with which the animals were affected. It will be noted that the most common diseases on account of which stallions were refused licences were whistling, roaring and sidebone, which account for 164 refusals out of a total of 244.

NUMBER OF STALLIONS REJECTED UNDER EACH DISEASE.

DISEASE.	CHARACTER.	SIDEBONE.	RINGBONE.	BONE SPAVIN.	DEFECTIVE GENITAL ORGANS.	SPRINGHALT.	SHIVERING.	GENERAL DISABILITY.	TOTAL.
48	69	47	1126	15	13	6	6	7	244

44 appeals were made against refusals of licences, and in 26 cases these were successful.

Horse Breeding Act, 1918.—During the second year's working of this Act, i.e., the licensing year, 1st November, 1920, to 31st October, 1921, the number of stallions licensed was 3,816 and 244 were refused (18 of the latter on appeal). These figures show a slight increase over the number of stallions licensed in the previous season 1919-20, when the comparative figures were 3,749 and 404 respectively, whilst there was a marked decrease in the number of stallions for whom licences were refused. Of the 3,816 licensed stallions, 3,418 were pedigree animals and the remaining 398 were horses that were not entered or accepted for entry in any recognised stud book.

The figures given in the following statement show the popularity of the Shire Breed, the numbers being 2,316, or 68 per cent. of all the pedigree stallions licensed.

National Stud.—The Stud continued to show a satisfactory profit for the year ended 31st December, 1921, the amount being approximately £8,300. During the year it was found necessary to purchase a sire in place of Royal Realm (dead). The stallion purchased was "Silvern," by Polymelus out of Silver Fowl by Wild Fowl, and was bred by Sir E. Hulton, Bt. It won five times as a 3-year-old and was placed 2nd in the St. Leger and Eclipse Stakes. As a 4-year-old it won the Coronation Cup.

The chief items on the credit side of the account were (1) £80,000 realised by the sale of bloodstock, (2) £7,000 by the sale of cattle, and (3) £2,700 for service fees.

Sixteen yearlings were sold in 1921 realising a gross sum of £31,200, i.e., an average of £1,950. The highest price (£8,400) was obtained for a colt by "Tracery" out of "Countess Zia."

The Stud again occupied a prominent position in the list of winning breeders.

* * * * *

EGG FARMING:

SOME NOTES ON LEAN-TO ROOF TYPE OF LAYING HOUSES.

MAJOR C. H. EDEN,

Ministry of Agriculture and Fisheries.

In this *Journal* for August, 1922, p. 463, a brief account was given of the type of laying house used in the Basingstoke district, including the chief dimensions of the 500-bird houses in use on Mr. Holdaway's farm at Woodmancott. The illustrations here



FIG. 1.—Large Brooder House with roof sloping to the front.



FIG. 2.—Extension of Brooder House, with roof sloping to the back.



FIG. 3.—Laying House with capacity for 500 hens.



FIG. 4. Interior of Large Brooder House.

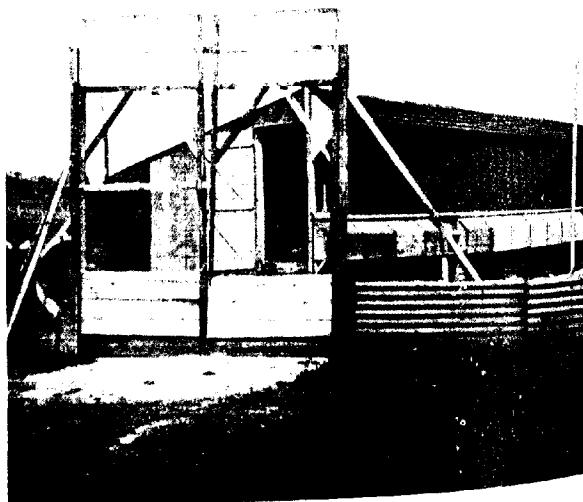


FIG. 5. Part of the front of Laying House showing large entrance gates.

which were all taken on Mr. Holdaway's farm and will make clear the type of house in use. Fig. 3 illustrates the back of one of the 110 ft. x 14 ft. laying houses having a capacity for 500 birds, and Fig. 5 shows a part of the front and also the large double wire gates to the pen to allow a cart being driven through them.

The houses are of the lean-to type of roof construction, which is by far the most common in use at the present time, and which in practice has proved successful. It is essential, however, that care should be taken in designing houses of this pattern, for it has been found by experience that certain conditions are necessary for the best results.

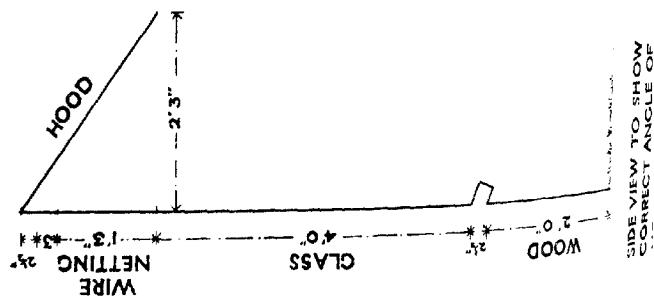
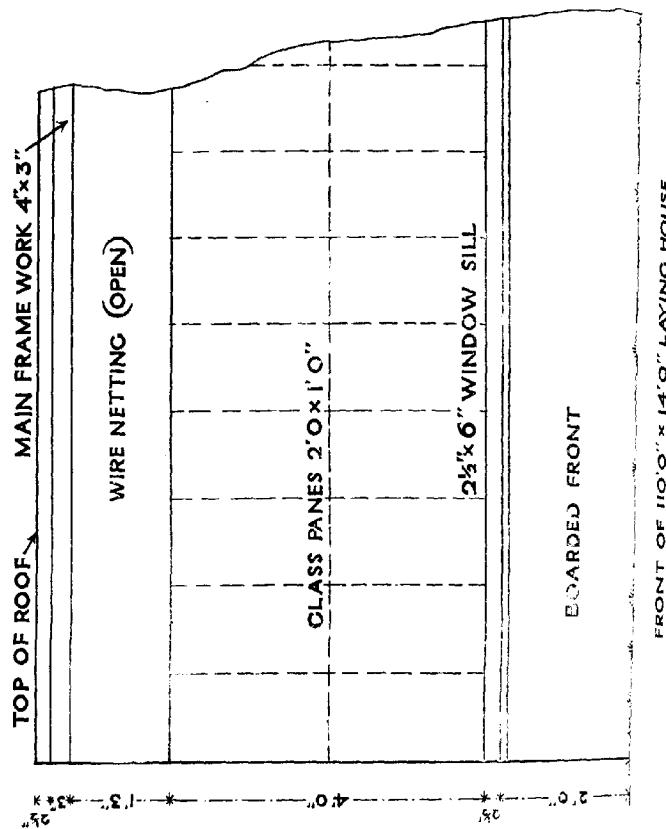
In considering the main dimensions it is first necessary to decide on what unit of birds it is intended to house, and an allowance of at least 3 sq. ft. of floor space per bird must be given for scratching purposes.

The depth is an important item. Houses of this type were at first made 9 ft. wide, but it was found that this entailed a very long building if, say, a 500-flock unit was to be accommodated, and the tendency now is to make them wider and shorter in proportion. With this type of roof it is not advisable to exceed a depth of 14 ft. unless arrangements are made for back ventilation and also for the placing of windows in the back, an arrangement which entails extra work in construction. Further, if a deeper house is desired it is preferable to employ a different roof construction.

With 14-ft. houses the front should be 8 ft. high to ensure good light at the back and also provide sufficient fall for the roof without making the back too low. If the back is too low trouble will probably be experienced with colds among the birds as there will not be sufficient space above their heads whilst roosting, since the dropping boards must be placed high enough to allow of the space underneath being used for scratching purposes. Another disadvantage of a low back is the discomfort caused to the attendant when cleaning dropping boards.

With regard to the front of the house Fig. 6 gives the details of the front shown in Fig. 5, and shows the correct angle for the hood, this latter being an important detail. The hood is provided to prevent driving rain from entering the open portion of the front of the house during wet weather, and to ensure this the bottom of the hood should be brought down level with the top of the glass. It also comes into operation during the hot summer days, since if the angle is correct the glass front is

[Oct.,



shaded by it during the mid-day hours and it consequently helps to keep the interior of the house cool.

In the house illustrated the nest boxes are of the outside type, but the collection of eggs is made from the inside of the house. The bottom of the nests is on the level of the floor but a $10\frac{1}{2}$ -in. board is placed in front to prevent litter being scratched into them. In many of these large houses nest boxes are placed on either side of the draught partition, a space being left next to the partition for the birds to gain access to the nest, and a roof at a sharp angle is provided to prevent birds from roosting on it. This system provides darker nests which are sometimes preferred by the birds, but the collection of eggs is not so easy, and they are more expensive to construct.

Dry mash hoppers are placed in any convenient space available, but it should be the aim to leave the floor space free from any obstruction so as to devote as much space as possible for scratching purposes.

The roof, back and sides of the house illustrated are covered with felt, and it will be noticed that wooden strips have not been used for holding down the felt. Each width of felt is allowed to overlap, the upper and lower surface being treated with a mastic cement, and the felt secured to the wood by means of large headed clout nails. By this means a practically solid joint is obtained excluding not only water but wind, which is the chief cause of damage to felt on the roofs of houses. It will be found best to start the felt at the bottom of the hood and carry it over the top of the roof, the strips being put on parallel to the sides of the house, that is, running from top to bottom of the roof.

* * * * *

CALIFORNIAN METHODS OF POULTRY RAISING AND MARKETING.

II.

Co-operative Marketing.—The Poultry Producers of Central California Incorporated, is an organisation typical of many in California designed to assist the farmer in marketing his produce in the most effective and economical way, and at the same time to obtain for him the best and most stable price possible.

It is proposed first to outline the methods employed at the Petaluma egg-depot itself, and afterwards to indicate the co-operative principles upon which the organisation is built.

The dépôt consists of a large rectangular building of one storey, situated near the railway station, and having sidings and loading platforms along both sides, a third platform being provided at one end of the building for the convenience of automobiles.

Eggs are delivered in boxes of 30 dozen each from the railway truck, or, if the farmer lives in the vicinity, from his motor car. The quantities marked on the card attached to the box by the farmer are compared with those entered on a card inside the box, which is then re-nailed lightly. The boxes are stacked upon a small platform very much like a sled and sent to the re-sorting men upon an ingenious four-wheeled trolley. This is run underneath the loaded sled and jacked up by a single movement so that the sled runners are clear of the ground. Piles of boxes are kept upon the sleds so that they can be conveniently moved at any time with very little labour, and with practically no risk of breaking the eggs. The boxes have already been marked by the farmer according to the grade of eggs which they contain. If a box contains eggs of more than one grade they are resorted and made up into full boxes by the re-sorters.

The complete boxes are then inspected to ensure that their contents reach the standard required for the grade. The eggs, which are packed in cardboard frames of 3 dozen each, are transferred in one movement to somewhat similar metal frames running on a grooved table. They are swiftly looked over by experts who pick out any which are over or under size, dirty or of a bad colour. The frames are pushed along the table by the inspectors and the eggs are re-packed in boxes as they reach the end, the wire frames being shut up and returned along an overhead rack.

The re-packed boxes are nailed up on the spot and removed on the sleds above described for shipment.

The extreme simplicity and effectiveness of this grading process is due almost entirely to the education of the individual farmer in the methods of the institution. The great majority of the members can be trusted to grade their own eggs with considerable accuracy, and the inspection is actually only necessary to ensure a standard common to all the consignments and to detect occasional errors.

For the same reason, candling is very little done, except in the case of new members or for other special reasons. All the farmers whose eggs pass through the dépôt are themselves

members, and realise that care on their own part is necessary in order to dispense with more elaborate arrangements, the expense of which would devolve, ultimately, upon themselves.

The above process is extended in the case of dirty eggs and of eggs for preserving. The dirty eggs are placed upon an endless band of rubber-covered rollers which is passed beneath a funnel emitting a sand blast. As the rollers cause the eggs to revolve they are thoroughly cleaned without the deleterious effect caused by water.

The eggs for preserving are placed upon wire frames similar to those used by the inspectors and immersed for a second or two in oil which is kept at a temperature of 250° Fahrenheit. This has the effect of driving out the air and of sealing the egg, thus rendering it capable of preservation for some months. It may be noted in passing that members are expected to send only sterile eggs to the dépôt.

After the completion of the various processes, the boxes are stacked according to the grade of eggs which they contain and loaded on to barges for shipment to San Francisco, or on to railway wagons if for shipment by land.

It will be noted from the above that the association does little beside co-ordinating the efforts of individual farmers. It in no way relieves them of the responsibility of delivering their eggs in the best possible state for marketing. If the grading and packing work at the dépôt runs smoothly, it is because the farmers themselves have taken great pains that it should do so, by performing their own task as efficiently as possible. This is a point of some importance, as indicating the value of individual care as a first constituent of co-operation.

It might be thought that, since only some 65 or 75 per cent. of farmers in the district are members of the Co-operative Marketing Association, its usefulness was problematical. Actually, the proximity of Petaluma to the markets of San Francisco and the Bay Cities adjacent thereto makes it a simple matter for many farmers to make contracts for the sale of their eggs without having recourse to the association : it is when the industry outruns its local market that such a society becomes necessary. In short, though a prosperous co-operative society may be regarded as a criterion of the success of an industry, it is a result of success rather than its cause.

Constitution of Societies.—The question of the constitution of co-operative societies has received much attention in California. Such societies are to be regarded as accessory to the individual in

his business, and not as profit-making concerns. They are to provide assistance to the farmer in proportion to the size of his business through them, and to ensure that none but he and his associates have the controlling interest. The constitution of the Poultry Producers of Central California Incorporated, follows the main principles which have now been accepted in this country as essential for *bona-fide* co-operative concerns. The initial capital is supplied by local poultry farmers and subsequent issues are governed by the size of the applicant's poultry ranch, i.e., he can only be allotted one \$10.00 share for every 1,000 hens or majority fraction thereof owned by him. Since he must, upon joining, sign an agreement to sell and deliver to the society all the eggs and poultry which he markets, it will be seen that the stock is fairly equitably divided.

The society is governed by a board of eleven directors, all of whom must themselves be poultry producers. An exception is made in the case of one of the directors, who is nominated by the State Market Director of California. There is an Executive Committee of five directors, and a salaried general manager. In addition to the usual annual accounts, the society issues a monthly auditor's financial statement showing the assets and liabilities, and the volume of business and operating costs during the month in question.

Methods of Selling.—The society sells the eggs at the best price it can get, and hands over the proceeds at the average price for the week to the producer, less the cost of the egg-boxes and certain other expenses. These include transportation, and a charge not exceeding 1 cent. per dozen eggs for operating and selling expenses. At the end of the fiscal year a reasonable amount is put aside for reserves, dividend, advertising, etc., and the balance of the surplus, if any, is divided among the members according to their deliveries.

In addition to this, 1 cent per dozen is deducted from the selling price of the eggs handed to the producer, and placed to his credit towards the purchase of further shares. As soon as \$10.00 is made up in this manner the producer is given a further share in the society. This procedure will, however, cease as soon as the authorised capital has been paid up.

In times of plenty, the society, at its discretion, places a proportion of the eggs delivered in store, paying the producers at the end of the week at the current market price. When it is considered wise to sell these, the producers generally are

credited with the further profit made, or debited with the loss incurred should storage and insurance absorb the profit. This second transaction is, of course, between the society and those producers only who made deliveries during the week in which the eggs were put in store.

The society has the right to send eggs to any market which it may consider advisable, and in that case is considered to have bought the eggs at the current market value at the time of shipment. The profit or loss on these transactions is, however, credited or debited to the general corporate fund, and not directly to the producers.

This Central Californian Society has not considered it yet necessary to apply co-operative methods to the marketing of poultry, but should it decide to do so, the members, after ten days' notice, are bound to begin delivering their poultry for marketing to the society as they now do their eggs.

These are only main points in an organisation typical of many which exist for the marketing of various agricultural products in California.

It is thought that American methods could profitably be studied by poultry farmers in the United Kingdom. This is not to say that imitation of particular methods is all that is desirable, or that such imitation would, in fact, revolutionise the British poultry industry. The main point is the necessity of business principles in the building up of a prosperous industry. These have been applied with such conspicuous success in the United States, and notably in the district referred to above, that persons interested in the industry would be well advised to make a close study of these principles and the methods to which they have given rise. In particular, the spirit of co-operation and a certain financial courage, when allied with individual hard work and enterprise, would appear to be the main desiderata for success. When it is realised that so compact and successful a community as that of Petaluma has grown up in a State the size of England, but with only one-tenth the number of inhabitants, the possibilities of the poultry farming industry in the United Kingdom, where so tremendous and convenient a market exists, would seem to deserve exploitation to the fullest possible extent.



[Oct.,]

SADDLEBACK OR SHEETED PIGS.

SANDERS SPENCER.

THE breeders of this curiously marked pig are probably in a better position than those of any other breed of pig to prove its antiquity and originality, as it is recorded that sheeted pigs were exported from England about one hundred years ago to the United States, where they have proved so successful that it is estimated that its breeders number at least thirty thousand. For many years the saddleback or sheeted pig passed in the States under the name of The Thin Rined Pig, etc., but a few years ago the breeders determined to alter the name of their society to that of "The Hampshire Pig Society." Some surprise has been expressed with the choice of name since it is not considered that Hampshire is one of the principal homes of the saddleback pig, but it probably arose either from the original importation having been made from Hampshire or from the name of an early breeder.

The name adopted in America appears to have given rise to a discussion of the question as to the original home of the Saddleback pig and this again has led to the expression of opinions as to which of the two districts has succeeded in retaining the greater portion of the points and character of the original breed. Before a decision could be arrived at on this point, would it not be necessary to arrive at a conclusion as to whether or not there existed both in the South and in the East a native breed of pigs of a very similar colour and character? If the first importation into the United States came from Hampshire, sheeted pigs were evidently in the South of England at least as far back as the beginning of the past century, and on the other hand we find one of the old writers on pigs stating that "the original Essex pig was a parti-coloured animal, black with white shoulders, nose and legs—in fact a sort of 'sheeted' pig, large, upright and coarse in bone." Another old writer asserts that "there is another improved Essex breed, called the *Essex half black*, resembling that which I have described in colour, said to be descended from the Berkshire. This breed was originally introduced by Lord Western, and obtained much celebrity." Another quotation runs, "Lord Western," according to Mr. Youatt, "was at one time in possession of the best breed of Sussex pigs, therefore it is most probable that he used them to turn the old black



FIG. 1.—A Wessex Saddleback Boar.

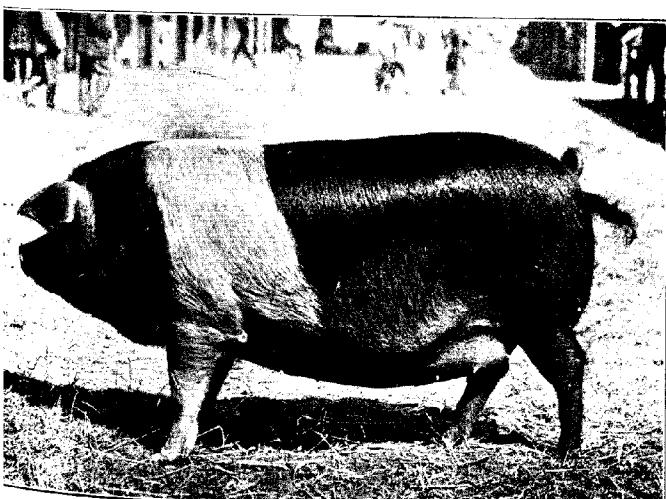


FIG. 2.—A Wessex Saddleback Sow.

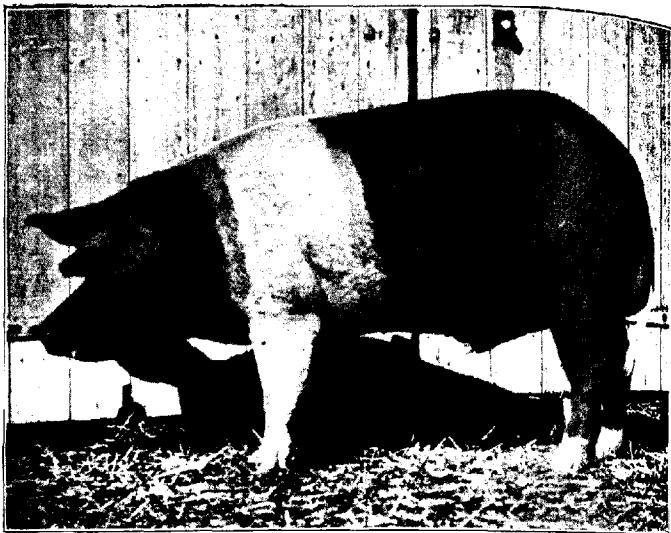


FIG. 3.—An Essex Saddleback Boar.

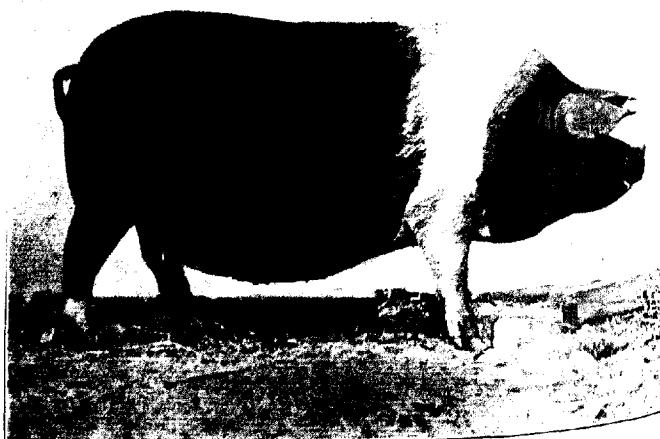


FIG. 4.—An Essex Saddleback Sow.

and white sheeted Essex pigs black." Although the same author gives a description of the Sussex pig of that day—about 1830—he omits to describe the colour of it. However, it is on record that Mr. Western, or as he subsequently became, Lord Western, did purchase sheeted pigs in the South of England in the early portion of the last century and kept them on his estate in Essex.

The sheeted pig was not kept in its purity in Essex to any very great extent during the latter half of the last century, but the persistency with which the sheeted markings appeared in pigs which were admittedly of mixed breeding may be said to prove that the foundation breed of the Essex pig must have possessed many of the characteristics, including the colour, of the sheeted pig as it is known in the Eastern and Southern counties.

There surely must be a sufficient similarity in the form, character and colour of the two types of saddleback pigs to render it advisable that a junction of the two societies should take place, so that the whole of the energies of the breeders of Saddleback pigs, whatever their origin, should be concentrated on the extension of the undoubtedly many good qualities of the sheeted pig. The old saying that a house divided against itself cannot stand, may not be entirely applicable to the present position of two societies to look after the interests of one breed of pig, yet a combination of the best men of the East and of the South must be more pregnant of good than divided councils. It could hardly be beyond the power of a small Committee composed of two or three members of each Society and an independent chairman to devise a scheme which would prove beneficial to all the breeders of Saddlebacks and to the pig itself. It would indeed be a great pity that a breed with so many inherent good qualities should be delayed in its full development by a slight difference of opinion amongst its breeders in different parts of the country as to the value of certain minor points which are of greater fancy than commercial value. If proof were needed of the great value of amalgamation we have it exhibited in the affairs of the Large Black Pig Society. The types of pigs bred in the Eastern counties and in the South-Western Counties were decidedly different, yet by a combination of the two a breed has been evolved which has more supporters than any other single breed of pig. The breeders of Wensleydale sheep have also admitted the great value of combination by merging the two Flock Book societies into one.

This continued division of interest and energy would be most unfortunate, as the sheeted or saddleback pig has many

[Oct.,

good qualities, particularly those needed in pigs to be converted into bacon of the highest market value. These include fine quality of skin, bone and hair, lightness of forequarters, squareness of hindquarters, and a comparatively long back. Their flesh is also of good quality and possesses a large proportion of lean meat. It is quite possible that these good points will be esteemed of still higher value in the near future if the marked extension of the pig-breeding industry continues, as one of its results will be the production of a considerably increased number of pigs beyond those which are required for the pork trade alone. The surplus will need to be converted into bacon, a purpose for which the sheeted pig is believed to be particularly suited.

The breeders of saddleback or sheeted pigs both in the East and in the South appear to have realised the fact that the requirements of the bacon factor are worthy of the greatest consideration and they have endeavoured to improve their pigs on the lines indicated. It might be advisable if even still further attention were paid to length of body and shape and development of the ham, as these are two of the most important points in the bacon curers' model pig.

Each of the Societies has formulated a Standard of Excellence, that of the Essex Society being as follows:—

Head.—Medium length, broad.

Ears.—Medium size, carried forward, but not flopped.

Neck.—Medium length.

Shoulders.—Broad, but not open, deep, smooth and compact.

Chest.—Deep, full girth.

Buck.—Straight, broad and level.

Loin.—Broad and strong, free from slackness.

Ribs.—Well sprung and deep.

Sides.—Deep and full, long and smooth and free from wrinkles.

Flanks.—Full and well let down.

Hams.—Broad and well filled to hocks.

Legs.—Strong, straight, well set, with clean bone, feet medium size.

Tail.—Medium, fine and curled with white tip and well set on.

Hair.—Fine and silky.

Colour.—Black with the exception of white belt encircling the shoulder including forelegs, white hind legs not higher than hock, white nozzle and white tip to tail.

Condition.—Uniform covering of flesh, especially in region of valuable cuts.

Objections :—

Head.—Badger face.

Ear.—Erect or floppy.

Colour.—Blue coloured band between white and black on shoulder.
Black hind legs and tail.

The Standard of Excellence of the Wessex Saddleback Pig
Society runs :—

Colour.—Head and neck, black, white over shoulders and forelegs, hindquarters and hind legs, black.

Head.—Fairly large and straight snout, face not more than slightly dished, fairly wide between the ears.

Body.—Medium size with forward pitch, setting well close to the face but well carried, with fine fringe of hair, not too coarse, not too papery.

Neck.—Fairly long and muscular.

Hock.—Wide and deep.

Shoulders.—Wide and free from coarseness.

Heart Girth.—Full, not dropping away behind the shoulders.

Legs.—Strong and shapely, with medium bone.

Pasterns.—Strong and sloping, not too long.

Feet.—Strong and of a fair size.

Back.—Long and straight, not dishing.

Join.—Strong and broad.

Tail.—Set on high, preferably black, nicely tasseled.

Sides.—Deep.

Ubs.—Well sprung.

Snout.—Thick and well let down.

Quarters.—Long and wide.

Thighs.—Broad and full and deep to hocks.

Maint.—Moderately fine and straight, not curled.

Retention.—Fine, gay and free.

Indesirable Features, not necessarily disqualifying during inspection period.—

Curly coat; coarse mane; crown on back; short or turned up snout; over-heavy shoulders; wrinkled skin; infant knees; hollowness at back of shoulders; any malformation; colouring white on any part but the saddle. Prick ears; ears unduly floppy or rhubarb-like.

* * * * *

THE APPLE BLOSSOM WEEVIL.

HERBERT W. MILES, B.Sc. (Bristol),

University of Bristol.

THE Apple Blossom Weevil (*Anthonomus pomorum*, Linn.), which is annually responsible for much loss in apple growing areas, was mentioned as long ago as 1801 by Knight in his "Treatise on the Culture of the Apple and the Pear" and since that date the writers of almost every decade have had something to say regarding its habits and life history, and have suggested various methods of control. Much confusion, however, existed with regard to its habits and life history, and the ravages of the pest were so marked in 1919 and 1920

that it was thought advisable to spend a considerable time in working out the details and in studying control methods. This work has been in progress at the Agricultural and Horticultural Research Station, Long Ashton, since September, 1920, and the following is a summary of the results.

Life History.—Towards the end of March the weevils leave their winter quarters, and, warmed by the sun, crawl to the smaller branches of apples and pears, and piercing the blossom buds as soon as they show green at the tips, thrust the rostrum, or trunk, downwards towards the growing point and suck the juices. It is at this period that the use of the "V" mark on the elytra is important for the weevils are very much exposed to the attacks of birds. This mark splits up their outline and affords considerable protection as shown at A, Fig. 1, where the weevil fits the colours in with its immediate surroundings. This spring feed stimulates the sexes and mating takes place. Alternate periods of feeding and resting in any available shelter now extend until the blossom buds reach that stage of development known as the "Cluster-bud" stage, *i.e.*, when the first young leaves bend outwards revealing the individual flower buds in a compact cluster (A, Fig. 2). This stage is usually reached within five weeks after the first appearance of the weevils—in 1922 the weevils were first seen feeding on 23rd March and the "cluster-bud" stage was reached by 28th April. Egg-laying now takes place: the female selecting a flower bud proceeds to drill a hole into it with her rostrum which penetrates calyx and petals and scoops a hollow cavity in the anther lobes. This operation takes about ten to twelve minutes, after which the female reverses her position and thrusting her ovipositor into the hole deposits an egg in the prepared cavity in the anther. This takes from one to two minutes. The cavity is not closed up with saliva as was formerly thought but by the congealing of a sappy exudate from the damaged tissue of the calyx. After about eight to thirteen days the eggs hatch and the young larvæ or grubs commence feeding on the pollen cells of the anthers. Feeding goes on for a fortnight to three weeks during which time the anthers, filaments and styles are destroyed, and often the surface of the receptacle is damaged. The larvæ gnaw at the base of the petals with the result that the petals do not open in the ordinary way but dry and form dome-shaped coverings under which the larvæ live. These are known as "capped" blossoms. Several molts



FIG. 1.—Apple Blossom Weevils feeding in Spring. The branch in bud-green stage.



FIG. 2.—Typical Canker Shot which would afford winter shelter to Apple Blossom Weevils. "A," Cluster-bud stage suitable for oviposition.

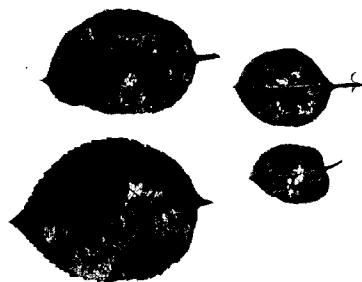


FIG. 3.—Damage to Apple Leaves caused by young adults of the Apple Blossom Weevil.

take place during the larval life and the last of these reveals the pupa or chrysalis, which occupies the capped blossom for about a week, at the end of which period the young adult emerges, and, after hardening up, cuts its way out.

The young adult weevil emerges about the beginning of June in early seasons, but not until the end of June in late seasons, and spends about a month feeding on the under-surfaces of the young leaves of the apple (Fig. 8). It discards the lower epidermis and feeds on the mesophyll or internal leaf tissue leaving the upper epidermis intact. Feeding goes on for from three weeks to a month, at the end of which time the weevils begin to seek winter quarters, selecting the following sites :—

- (a) Cracks and crevices in the trunks of apple, pear and plum trees and any other trees near the plantations. Canker spots are often selected.
- (b) Dead leaves, heaps of refuse, and under old grease bands where a paper foundation is used.
- (c) Hedge bottoms and in the soil.

Certain conditions seem to be necessary in the winter site selected, and the result is that when these conditions are fulfilled large numbers of hibernating weevils may be found close to each other. In Worcestershire, the principal hibernating quarters of the large bulk of weevils in plantations of smooth barked trees were found to be under the paper of old grease bands on both plum and apple trees.

Natural Enemies.—The Apple Blossom Weevil suffers to some extent from the attacks of birds, fungi, and insects. The birds which chiefly take the adult weevil are the woodpecker, tits, nuthatch and chaffinch, while the sparrow is recorded as pecking open the "capped" blossoms and taking the larvae or pupæ.

At Long Ashton many dead weevils were found during the winter; these had all been killed by a fungus which was apparently a species of *Isaria*, a common insect-attacking fungus.

The principal insect enemy of the Apple Blossom Weevil is an Ichneumon fly, *Pimpla pomorum* (Ratz.). The female parasite seeks out the young flowers infested with weevil grubs and therein lays an egg either on or near the body of the grub. This egg hatches and the young parasite, emerging, attaches itself to the larva or pupa of the weevil and proceeds to feed, growing very rapidly at the expense of its host which is finally destroyed. Dr. Imms, of the Department of Plant Pathology at Rothamsted, has shown* that this parasite is recorded as

* *Annals of Applied Biology*, Vol. IV, 1917, No. 4.

being very efficacious in keeping the weevil in check, and he records it as destroying 27.4 per cent. of the weevil grubs in Cambridgeshire in 1916. Numbers of parasites were reared at Long Ashton in 1921, the parasitism working out at 5 per cent.

Control Measures.—The Apple Blossom Weevil is possibly one of the most difficult of orchard pests to control, and it is very doubtful if any one-control measure will, of itself, give any appreciable freedom from loss. In view of this it is probable that several operations should be fitted into the routine work and these will tend to give increasing freedom from attack if followed year after year.

Banding.—This operation consists of tying corrugated paper, ordinary brown paper twice folded, or sacking round the trunks of trees fairly near the crotch. There are two periods in the year when banding is likely to yield good results. The first is in spring towards the end of March and on into April, the period when the weevils alternately feed and shelter. This is important in that weevils caught at this time have not commenced egg-laying. In 1921 Mr. D. E. Tower, of Pershore, tried banding in March and April and quite satisfactory numbers of weevils were caught. It was noticed that the bands sheltered more weevils early in the morning than later in the day and that most of them were located on the south side of the tree. The second period for banding would be from the end of June onward, the object being to supply the weevil with a readily available winter shelter. In 1921 at Long Ashton bands were put on in the middle of June with the result that most weevils were caught during July, August and September, the numbers rapidly decreasing as winter drew on. In this connection it is most important that the bands be in position early, otherwise the weevils may be driven to shelter by an early spell of cold weather and seek shelter out of range of the growers' treatment, e.g., in the bark of neighbouring trees such as oak and elm.

The bands may be examined about once per week in the case of the summer banding, but in the spring they need to be examined every morning as the weevils are very restless and move about from place to place on the tree during the day.

When the bands are removed the greater number of weevils will come away attached to them and can be shaken off into a bucket containing paraffin. Some weevils, however, may be

left behind on the bark; these should be either crushed or brushed off into the bucket.

Jarring.—This is a practice in favour with some growers who claim to have had good results by its employment. It is based on the fact that the weevil when in the tree will fold its limbs in close to the body and fall at the least shake or jar. Observations show that in spring at the first feeding period and until about half-way through the oviposition period the weevil is very responsive to jarring on bright warm windless days, but on cold days or windy days it will secrete itself between the cluster of young flowers and the leaves and no amount of jarring will induce it to fall; moreover, from about the middle of the egg-laying period the females are so busy egg-laying or resting that they will cling to the buds in spite of violent jarring.

One feature of jarring on ideal days is that the sun renders the weevils very active, so much so that they readily take wing, and numbers, having been jarred off and finding themselves falling, spread their wings and fly back into the branches.

Where a plantation lends itself to jarring, padded mallets or other strikers should be used and, to catch the weevils, a wide tarred sheet with a cut giving access to a circular opening in the centre for the reception of the trunk.

Spraying.—Spray treatment, as advocated from time to time, aims at :—(1) poisoning, (2) killing by contact, or (3) having some mechanical action.

The fact that, in the spring feed, in boring the holes for egg-laying, and in feeding on the under surfaces of the leaves, the surface tissue, i.e., the tissue that would be coated with any adherent poison, is rejected at once shows that little good can be expected from poisons such as lead arsenate; it is not surprising, therefore, that trials at Long Ashton yielded very unsatisfactory results. Nicotine has often been suggested as a spray but has only an anaesthetising action, the weevils quite recovering shortly after treatment.

Several caustic soda sprays and other winter washes were quite unsuccessful in laboratory trials conducted by the writer: where lime-wash was used, in an attempt at sealing the weevils up in their winter quarters, though made and applied under deal conditions, it proved most unsatisfactory, the weevils coming out to feed quite covered with the lime wash.

[Oct.,

The spray which yielded the best results at Long Ashton was an unstable paraffin emulsion. Numerous trials with different proportions of the mixture, were made, the greatest measure of success being obtained with :—

Potash soft soap ...	... ...	.5 per cent.
Paraffin ...	... ...	10 per cent.

The fact that paraffin readily comes out of this emulsion is a drawback to its use since it necessitates the mixture being kept agitated while spraying, but the instability is essential since it is by the paraffin that the insect is killed. The difficulty is overcome where a good mechanical agitator is used. The spray kills by contact and therefore needs to be applied only to those situations on the tree where the weevils are likely to be wintering. Canker spots, crevices, growth cracks and rough bark should be well drenched and a good force kept behind the jet. Where well wetted with the spray the weevils are killed within a quarter of an hour. For ordinary bush trees on paradise stocks, and reaching a height of about 6 ft., one gallon of the spray is sufficient for about three trees. For young and small trees a Knapsack spraying outfit would probably be found quite satisfactory. The spray should be applied towards the end of March.

Where lime-sulphur is used annually as an insurance spray a peculiar dry condition of the rough bark and crevices arises, and this condition is such that the sites are quite unsuitable as winter quarters for the Apple Blossom Weevil. This suggests that where the use of lime sulphur is regularly followed good results might be obtained by banding.

In addition to the treatments indicated, measures that will tend to make for an increasing freedom from the pest are keeping the trees clear of rough bark, mosses and lichens, and observing the rules of clean husbandry in the plantations.

Where practicable, as indicated in the leaflet on the Apple Blossom Weevil issued by the Ministry of Agriculture, collecting the capped blossom, destroying the weevil and liberating parasites are measures which, if followed systematically, may have very far-reaching results in controlling the weevil.

At present it is advisable that where great losses occur annually the methods herein indicated should be used either in their entirety or else modified to suit the particular circumstances. No one method is likely to give complete control but where two or three are employed in conjunction in plantations a reasonable freedom from this pest is obtainable.

SPOTTED MEDICK.

E. W. FENTON,
Seale-Hayne Agricultural College.

THE presence of Spotted Medick (*Medicago arabica*, All.; *M. maculata*, Sibth.) in scattered patches on the Seale-Hayne College Farm, and on other farms in the district early in 1920, led to the plant being very closely observed. During 1920 a certain amount of damage was done to hay and also in pastures. In

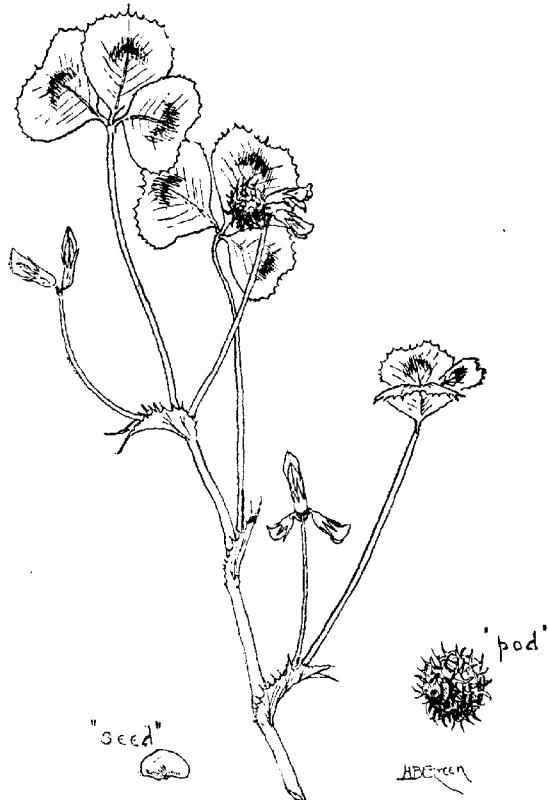


FIG. 1.—Spotted Medick as it appears in Meadow Land.

1921 the exceptional drought burned up all pasture and destroyed much plant life. When the drought broke, Spotted Medick was the first plant to recover; it grew rapidly and has since spread considerably. The possibility of further spread

and damage was obvious, and some means of eradication had to be found. Experiments on eradication were carried out and some success has been achieved.

Description.—Spotted Medick (see Fig. 1) is a herbaceous annual occurring by waysides, in natural grass lands, and in pastures. The numerous stems spread over the surface of the ground and only seldom assume an erect position. The leaves are trifoliate and usually each leaflet has a dark purple spot in the centre. The leaves are at first light green, and become darker after flowering. The prolongation of the leaf stalk, as in all medicks, projects beyond the stalks of the two side leaflets carrying with it the terminal leaflet. The small yellow flowers occur in pairs or a few together. The fruit consists of a spirally coiled pod, the edges having a double row of long curved spines, and the seeds are of a sulphur yellow colour.

Distribution.—Spotted Medick is a native of Western and Southern Europe, Western Asia, and North Africa. It is found generally in Central and Southern England, and occurs in certain districts of Devon. It is most readily observed along the roadsides, hedges and banks, but particularly in the neighbourhood of farms and frequently near the farm buildings. Its vivid green appearance and luscious growth at once mark it out from the rest of the vegetation.

In Cornwall, where it also appears, a curious story of its introduction to that county still survives. A ship with a cargo of Australian wool was wrecked off the coast. The wool was washed ashore and much of it scattered and carried by various means on to the land. As a result Spotted Medick gained a footing and since then has spread through the county. Although such an isolated case would not affect the whole country, yet wool may play a very large part in the introduction of seed to the land.

Life History.—The plant generally appears in the early spring, flowering, fruiting, and dying down, a second generation growing up during midsummer and again dying towards autumn. In the mild weather of the south-west it may succeed in setting seed more than twice. Three generations per annum are the maximum, but two are more common. In pasture or on arable land the number of generations in a year depends largely on circumstances such as weather, the closeness of grazing, the crop and cultivation. A plant so prolific can obviously spread with great rapidity if conditions are favourable.

Arable.—On arable land Spotted Medick seldom becomes a serious pest except through the spread of the fruits to neighbouring fields. In root crops cultivation kills it, in cereal crops it seldom grows to any extent, being crowded out. In hay, however, a different case arises. The rapid growth of the Medick enables it to outgrow grasses. Its rather prostrate growth shades the leaves of the young grass and even where a few plants do succeed in sending leaves through its dense mass of foliage, the grass is frequently borne down by the pressure and weight of the Medick. Should the season be a wet one, the Medick becomes heavy with rain, weighs down the grasses, and if it has reached the fruiting stage, the whole mass rots. In the summer of 1920, a small field of about one acre in extent was left for hay. At harvest time half of the total

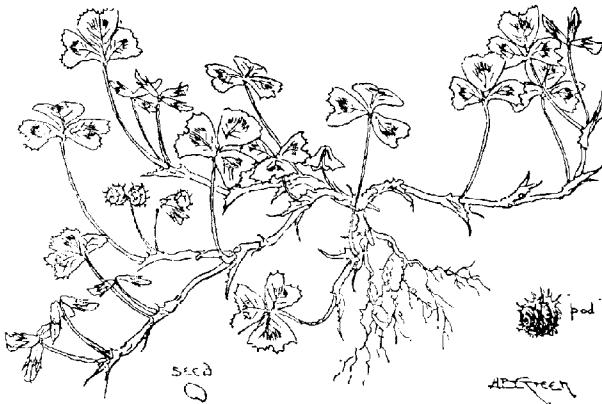


FIG. 2.—Spotted Medick as it appears in Pasture Land.

crop was lost, owing to the Medick crushing out most of the grasses, weighing down the rest and finally rotting. So far none of the large fields have been affected to any great extent, but should Medick again appear extensively the result may be a serious loss.

In Grass Land.—In pastures the Medick problem is still more trying. Here Medick will be cropped to a certain extent and it assumes a very dwarfed habit of growth not unlike wild white clover, except that the leaflets are very broad at the tip with a slight notch (see Fig. 2). The purple spots under such circumstances often do not develop. In this state Spotted Medick is by no means easy to detect. It crowds out practically every other plant, and several patches last

[Oct.,

spring, where wild white clover was plentiful, are now, owing to the drought, a complete carpet of Spotted Medick. A pasture where Spotted Medick is present will show bare patches at a time when the rest of the pasture is quite green. This is due to the fact that the Spotted Medick has completed its life cycle, and has set seed. An examination of the ground will reveal a plentiful amount of the "burrs" or fruit. A few weeks will elapse before the next generation of Spotted Medick arises and meantime the patch, which may have an extent of some square yards, becomes crowded with weeds. As in hay, so in pastures, before they are finally crowded out, the weeds succeed in maturing their fruits and these are dispersed to the detriment of the pasture.

Information has just been received that Spotted Medick is causing considerable trouble in certain pastures in the Isle of Wight. It is stated that stock readily graze the Spotted Medick till in flower, but after that stage refuse to eat it.

Method of Distribution.—The spread of Spotted Medick on the farm is very easy. The double row of hooks on the edge of the twisted pod cause it to catch in the hair of animals. In the case of sheep it catches in the wool and is most difficult to remove. The difficulty, however, is not its spread within a certain area, but its presence in quantity in certain areas and not in others. Spotted Medick is found fairly frequently in some localities while the plant in others is unknown. Until coming to Devon, the writer had never seen the plant, and the fact that it occurs plentifully only in certain places seemed peculiar. Shortly after this, specimens were received from Kent, where it has been a pest in orchards and was spreading; there the source of the outbreak was said to be shoddy. Some time later a sample of cleanings obtained from a wool mill was found to be filled with the fruits or burrs. Finally, a visit to a wool mill in Devon completed the story. The skins of sheep with wool complete, were received from South Africa and Australia, packed in large bales. Every bale examined contained a plentiful supply of the burrs of Spotted Medick. Several of the older workmen stated that the burrs came with the wool from Australia many years ago, but not in that from South Africa. Later some sheep from Australia were imported to South Africa, and soon the burrs appeared in the wool of the South African sheep, and now it often contains more than the Australian wool. The washings of the wool and the cleanings contain a marvellous assortment of fruits and seeds, in-

cluding a very high proportion of Spotted Medick. This refuse is used by many farmers and put on the land and explains the occurrence of Spotted Medick in large quantities in certain localities, while it is absent in others, although soil and situation are similar.

Eradication.—Spotted Medick being an annual, eradication is largely a question of destroying the foliage at an early stage. Two methods are possible, wet and dry spraying. The time of application of the spray and the conditions are most important. For both wet and dry spraying the weather must be dry, sunny and the air still. Wet weather or moisture minimises the effect of the chemical used, while sunshine helps considerably. The effect of the dry spray is to scorch the tissue of the leaf, and finally to destroy it.

To test the various chemicals used, only small plots 8 sq. yd. were treated, and the result of these used for trial on a larger scale. The sprays used were as follows:—

Wet Sprays.

Copper Sulphate	... 2 per cent. solution	failure.
Caustic Soda	... $2\frac{1}{2}$ " "	failure,
		unless a very large quantity used when grasses were seriously damaged.

Sulphate of Ammonia 5 " " " failure.

Dry Sprays.

Kainit.

10 oz. per 8 sq. yards	not satisfactory.
5 " " " "	failure.

Nitrate of Soda,

10 oz. per 8 sq. yards }	stimulated growth of
5 " " " "	Medick.

Sulphate of Ammonia.

12 oz. per 8 sq. yards. }	
10 " " " " "	
9 " " " " "	all gave good results.
8 " " " " "	The smaller quantities were slower
7 " " " " "	acting.
6 " " " " "	
5 " " " " "	

The sulphate of ammonia plots were the only successful ones and they were repeated with the same result. The larger applications showed quicker results, but the final result was the same provided the distribution of the powder was carefully done over the area under treatment.

The result is most unsatisfactory when the weather is wet. Sunshine is also an additional advantage. Even if the weather

is dull and the atmosphere moist the result will be good, but the spray will require a longer time to act. The early spring is the best time for spraying, particularly when the leaves are fresh and tender.

The result of treating with sulphate of ammonia will be evident within three days or less, depending on conditions. By the end of a week, if there is a large number of Medick plants present, the area treated will be recognised by the brown colour due to the withering of the Medick and the consequent bare patches of soil. Shortly after this the grasses exhibit vigorous growth and in a few weeks the areas become green unless weather conditions are adverse. It may in some cases be necessary to sow a little seed on the bare patches, especially if there are weeds present, which will usually have been destroyed at the same time as the Medick.

As only areas in a pasture will need treatment, the sulphate can easily be applied by hand, or, if it is decided to treat the whole field, a manure distributor can be employed. Sulphate of ammonia possesses a double advantage as it not only destroys Spotted Medick, but at the same time stimulates grasses of the best quality. Hence the treatment is not a case of spending money only on the eradication of a weed, but of manuring the pasture which will give a return for the money spent on the manure and its application.

* * * * *

CONCILIATION COMMITTEES: A YEAR'S WORK.

IT is now twelve months since the machinery for the compulsory regulation of wages in agriculture by the Wages Board was replaced by the present system of voluntary Conciliation Committees, and it may be of interest to review the progress of the Committees up to date.

Constitution.—Under the terms of the Corn Production Acts (Repeal) Act the members of the District Wages Committees of the Agricultural Wages Board became Interim Conciliation Committees pending the formation of permanent Committees. The Act avoided laying down any hard and fast lines as to the constitution of the Conciliation Committees, the only stipulation being that they should be composed of representatives of persons (whether owners or occupiers of agricultural land) employing

workmen in agriculture and of such workmen. As was anticipated, in several cases local feeling was in favour of forming Committees for smaller areas than had existed under the Wages Board and in consequence the 39 District Wages Committees have been replaced by 61 Conciliation Committees. In 26 cases the original areas have been retained but in certain cases where sub-division has taken place, as many as five separate Committees have been formed for a single county.

Under the Act an Interim Conciliation Committee can hold office until the 19th August, 1923 (*i.e.*, two years from the date of the passing of the Act), but nearly all the Conciliation Committees have now adopted some form of permanent constitution. A suggested form of constitution has been supplied by the Ministry providing *inter alia* for the regular retirement of a proportion of the members and for their re-election. Fifteen of the Committees have taken advantage of the Clause in the Repeal Act enabling them to appoint an independent chairman (without power to vote). In the majority of the other cases the chair is occupied alternately by a leader of each side.

Wages Agreements.—Although the Agricultural Wages Board did not expire until the end of September the Ministry had suggested that the Interim Conciliation Committees should meet well before that time in order to agree on rates as from the 1st October and thus avoid a break in continuity, and in spite of all the difficulties in the transition to a completely new system, more than half of the Committees were able to reach provisional agreements accordingly. Most of these agreements were for a short period only—many of them simply prolonging the operation of the rates as left by the Wages Board. In other cases, however, wages were immediately reduced by 2s. to 4s. from the 42s. of the Wages Board.

By the end of October considerable progress had been made, agreements having been reached in 29 of the 53 areas for which Committees had been formed by that date. The average rate of wages for adult male workers by the end of November had fallen to about 38s. At the end of the year the number of Committees had increased to 57, of which 40 had made agreements at one time or another, 31 agreements being current at that date. Most of the agreements had been made for only short periods and were due to expire at the end of the year, but no difficulty was found in arranging further meetings of the Committees and it was soon realised that for the interests of both sides agreements should be made for reasonably long periods. An excellent lead

was given to the Committees in this respect by the agreement reached by the Northamptonshire Committee on the 16th January, the agreement being made to cover the whole of the farming season to the beginning of October. Certain Committees, however, have preferred to avoid fixing a definite period to their agreements but have made them for undefined periods with a proviso for termination on specified notice by either side.

Taking the year as a whole, 55 out of the 61 areas have made agreements, there being 6 areas in which, notwithstanding frequent meetings, no agreements have been reached. About 40 agreements have been for periods of 5-6 months (or more).

Average Wages.—With the falling prices of farm produce and the drop in the cost of living, the tendency of wages throughout the year has been downwards. Owing to the variations in hours and overtime and the absence of agreements in certain areas, only an approximate estimate of average wages for the country as a whole is possible, but taking the agreed rates in the various areas on a weekly basis and making allowance for the prevailing wages in areas without agreements, it is estimated that average weekly wages of ordinary adult male workers have varied as follows:—

1921.	s.	d.	1922.	s.	d.
August ...	46	6	January ...	33	6
September ...	42	6	February ...	33	0
October ...	40	0	March ...	32	6
November ...	38	0	April—August	32	0
December ...	37	0			

The figure for September, 1921, is the minimum rate of wages as last adjusted by the Agricultural Wages Board and that for August, 1921, represents the average minimum rate in force during the previous 12 months. It will be seen that the average wage in August, 1922, had fallen by 14s. 6d. or about 30 per cent. from the minimum rates ruling during the last year of the Wages Board's existence, but that taking into consideration the last reduction made by the Wages Board, wages have fallen only 10s. 6d. or 23 per cent. during the period of the actual working of the Conciliation Committees. The Ministry of Labour's cost of living index figure on 1st August, 1921, was 122 per cent. above the 1914 base, and had fallen to 81 per cent. on the 1st August, 1922, i.e., a decline during the year of about 18 per cent.

Space does not permit of a full record of the various rates which have been fixed by the Conciliation Committees within the last year, but although the weekly wage in the period April-

August of this year is estimated at 32s. for the country as a whole, wages in the different localities vary considerably above and below this figure. In the Northern group (Northumberland, Westmorland, Durham, North Riding, Cumberland and Lancs.), for example, the average wage is about 34s., whereas in an Eastern group (Norfolk, Suffolk, Cambridgeshire, Beds., Hunts., and the Isle of Ely) it is only 31s.

The following table compares the rates in the areas where the highest and lowest rates have been fixed:—

<i>High Rates.</i>	<i>Committee.</i>	<i>Rate.</i>
Winter, 1921-22...	Lancashire (average) ...	47/6 for 60 hr.
	Durham ...	44/6 „ 50 „
	S. Northumberland ...	44/6 „ 48 „
Summer, 1922 ...	Lancashire (average) ...	43/4 „ 60 „
	Durham ...	35/- „ 50 „
	S. Northumberland ...	32/- „ 50 „
<i>Low Rates.</i>		
Winter, 1921-22...	Sussex East ...	31/- „ 52 „
	Dorset ...	32/- „ 48 „
	Brecon and Radnor ...	34/- „ 50 „
Summer, 1922 ...	Anglesey ...	30/- „ 56 „
	Cumberland and Westmorland	30/- „ 54 „
	Wiltshire ...	30/- „ 52 „
	Norfolk ...	30/- „ 50½ „
	Kent, Hereford, Oxford, Rutland	30/- „ 50 „

Comparing the "highest rates" areas in the above table it will be found that the average weekly rate fell from 42s. 11½d. last winter to 37s. 9d. during the summer of this year. Owing to the varying periods of agreement in the "lowest rates" areas it is not possible to make a similar calculation for the counties given in the table, but for such "low rate" areas as are comparable, e.g., Shropshire, Warwick, Devon, Somerset, the average rate fell from 34s. 7½d. last winter to 31s. 7d. in the summer. Thus the average decrease from winter to summer in the high rate areas is about 13 per cent. as against 9 per cent. in the low rate areas.

Ages and Classes of Workers covered by the Agreements.—Generally, the main agreements made by the Conciliation Committees refer to all male workers over 21 years of age, but in certain areas the Committees have stipulated that the rates shall apply only to "able-bodied workers" or to workers "of fair average ability," while in Surrey there is an upper age limit, the rates not applying to men over 65 years of age. In 5 areas the Committees, in addition to fixing rates for ordinary workers, have fixed special rates for stockmen, shepherds, etc., by which

such workers receive an inclusive wage to cover their extra time worked in connection with the care of animals.

In only 28 areas have agreements been made containing special arrangements for workers under 21. These rates are usually based on a proportion of the adult workers' rates according to the age of the worker. It is understood that in the areas where no agreements have been made for juvenile male workers this basis of payment is usually applied, the actual details being left for mutual agreement between workers and employers. Only 6 Committees have fixed rates for female workers, most of the areas concerned being in the North (Cumberland and Westmorland, Northumberland and Durham), where it is more usual than elsewhere to employ full-time women workers, but women's rates have also been agreed for Nottinghamshire and Devonshire.

Hours of Work.—Apart from actual wages one of the most contentious matters with which the Committees have had to deal is that of hours, and in the East Riding of Yorkshire and in one or two other areas serious trouble arose on this issue. In nearly half of the areas where agreements have been made the 50-hour week in summer has been retained, but in 11 areas the agreements provide for a week of 54 hours. In Lancashire the weekly rate is stated to cover the "usual" working hours.

Several Committees have fixed wages on an hourly instead of a weekly basis but in the great majority of these cases the worker has a guaranteed week of a specified number of hours. In Brecon and Radnor for example, where the wage-rate is 7½d. per hour to operate up to 60 hours before the overtime rate is payable, there is provided a guaranteed week of 52 hours.

A number of the Committees have not fixed any special rates for overtime: only 35 of the current agreements deal with this.

Benefits and Allowances.—In the earlier months there seems to have been a feeling that the system of benefits as fixed by the Wages Board should be continued. There appears now, however, to be a growing tendency amongst the Committees, except perhaps in Wales and the North of England, to confine their attention more and more merely to making agreements for a cash wage, and to leave all questions of benefits and allowances for settlement between individual workers and employers. In the early months many Committees dealt with the benefits question, but of the current agreements only 6 include clauses fixing valuations for the provision of board and lodging. These areas are, of course, those where a large proportion of the

workers live at the farmstead : Cumberland and Westmorland, Durham and Nottinghamshire, and in Wales (Anglesey, Carnarvon, Denbigh and Flint). In 5 areas the Committees have arranged a valuation for the provision of a cottage. In Pembroke £s. 6d. per week is allowed as a deduction from wages on this account, while in Stafford and Nottinghamshire the sum has been fixed at 3s. The 2 Northumberland Committees dealt with the matter very fully, and have agreed that the provision of a house and garden, coal leading and potatoes shall stand as payment for all stable time. Nottinghamshire has also met the "allowances" question in a practical fashion by arranging that the provision of milk shall be reckoned at the local wholesale price. Incidentally, there is no other area at present which has fixed a valuation for milk. Nottinghamshire has also agreed that the local wholesale price shall be regarded as the valuation for the provision of any potatoes. Under the Pembroke agreement planting potatoes and the haulage of fuel is regarded as equivalent to part payment at the rate of 1s. per week.

Half-holidays.—The observance of a weekly short-day, which as been strongly urged by the labour side, has not been seriously resisted, the Committees agreeing in general that where be workers desire the half-holiday the employers should facilitate the arrangement of the working hours as may be necessary. If the current agreements, 13 make definite provision for the observance of the weekly short-day, and it is understood that in many other areas an arrangement exists for ceasing work earlier on Saturdays or for casual holidays to be given in lieu.

Although the individual Committees are responsible for the form of the agreements, the Ministry has prepared the skeleton form of agreement shown below. The form is not intended to be exhaustive but it may be of interest as indicating the points most generally dealt with :—

**SPECIMEN FORM OF WAGES AGREEMENT FOR CONCILIATION
COMMITTEES.**

1. The minimum rate of wages for adult male workers employed in agriculture in the Committee's area shall be not less than /- for a week of hours (excluding Sunday).
2. All time on weekdays in excess of hours per week to be paid for as overtime at the rate of /- per hour.
3. All work on Sundays to be paid for at the rate of /- per hour.
4. The daily hours of work to be so arranged as to enable each worker, if so desires, to have a weekly half-holiday (either on Saturday or some other week-day if more convenient to the work of the farm).

[Oct.,

5. The rates for boys to be as follows:—

	<i>Weekly Rate*</i> (for a week of hours)	<i>Week-day Overtime.</i>	<i>Sunday Work</i>
Workers aged 20 to 21			
" " 19 "	20		
" " 18 "	19		
" " 17 "	18		
" " 16 "	17		
" " 15 "	16		

6. In the case of a worker boarded and lodged by the employer, the latter shall be entitled to make a deduction from the weekly cash wage on that account. The deduction in the case of adult male workers provided with full board and lodging to be per week, and proportionate sums in cases where only part board or board only without lodging is provided. The deduction in the case of male workers under 21 and of female workers to be less in proportion to their wages.

7. The above rates shall not apply to those who are not able-bodied or who are mentally deficient.

8. This agreement is to operate from the¹⁹²², to the1923.

Signed on behalf of the Employers' Representatives—

Signed on behalf of the Workers' Representatives—

Date.....

Any question arising in connection with this agreement should be addressed to the Conciliation Committee, the Joint Secretaries of which are (Employers' Side) and (Workers' Side).

Harvest Work.—In Essex, Anglesey, Suffolk, Norfolk and the East Riding, the Committees settled special rates for harvest work either by the payment of increased hourly rates or on the "seeing it in" basis, while in certain other areas it is understood that arrangements have been made for the payment of a harvest bonus as usual in accordance with the local custom, but with a reduction in the scale commensurate with the fall in ordinary wages.

Observance of Agreements.—From inquiries which have been made by the Ministry's conciliation officers and by the District Commissioners it is quite clear that the rates agreed by the Committees are generally being well observed. Isolated cases of non-compliance have been brought to the Ministry's notice, but except in the cases of non-union farmers, the employers' side of the Committees have generally been able to persuade defaulters to comply with the Committees' decision.

In their power under the Corn Production Acts (Repeal) Act of making their agreements legally binding on all employers

in the area by submitting the agreements to the Minister for confirmation the Committees have, if the necessity arises, an effective method of dealing with employers who will not abide by the terms agreed by their representatives on the Committees. So far only 5 Committees (Cambridgeshire, Isle of Ely, Surrey, Warwickshire, Denbigh and Flint) have taken advantage of the provisions of the Act in this respect.

The majority of the present agreements are now due to expire, but many meetings have already been arranged by the Committees and it is hoped that fresh agreements will be made very shortly.

Recent Changes.—During the past month a long agreement has been reached by the South Middlesex Conciliation Committee. The Committee's previous agreement which was due to expire on the 2nd September, 1922, has been extended to the end of that month and a new agreement made covering the twelve months October, 1922, to September, 1923. The new agreement provides for a rate of 7½d. per hour for adult male workers, which in the case of ordinary workers is to apply up to 50 hours per week with a guaranteed week of 48 hours, and in the case of special classes of workers (such as stockmen) to apply for 60 hours per week. Provision is also made for overtime rates of 9d. per hour on weekdays and 10d. per hour on Sundays.

The fact that this Committee has been able to arrange wages in advance for the whole of the farming year 1922-23 marks an important development in the work of the Conciliation Committees.

Agreements have also been reached in Derbyshire and Nottinghamshire, the Committee for the former area agreeing to the payment of 7d. per hour for all hours worked on weekdays, and 9d. per hour on Sundays until 31st December. In the Nottinghamshire area the rates agreed are 30s. for 52 hours, with 8d. per hour for overtime on weekdays and 9d. per hour on Sundays until 28th February, 1923. The Nottinghamshire Committee has also arranged rates for male workers under 21 years of age and for female workers of all ages, and has drawn up and accepted a scale for the provision of allowances.

Notice has been received from the employers' sections of the Surrey and Cambridgeshire Conciliation Committees to terminate its from the 30th September and the 6th October respectively the current confirmed agreements of these Committees. It may be presumed that this step has been taken to clear the path for consideration of revised rates of wages.

* * * * *

THE FARM WORKER IN SCOTLAND.

PERMANENT male farm workers in Scotland may be classified as follows:—(1) stewards, grieves or foremen, (2) ploughmen, (3) cattlemen, (4) shepherds, and (5) orramen, including all workers not in charge of animals, and as a general rule a further distinction must be made between married and single workers. Married farm workers are treated as a separate class from the single men and lads. The most important class of worker is the married ploughman, whose wages and allowances and hours of work usually determine the corresponding earnings and working hours of the other classes.

Practically the whole of the farm work is performed by the regular farm staff. A few casual labourers are employed at busy seasons, and during hay time and harvest and for potato planting and lifting many women and children are temporarily engaged.

Housing.—Almost every moderate-sized farm is provided with one or more cottages, which are generally occupied by married men on the permanent staff of the farm. A farm worker's son working on a farm with his father is frequently hired under the "double binding" system, common in the south-western counties, and unless he can find accommodation in the family cottage, is housed in a loft or attic in the farm buildings, but more often with other single men and lads in a separate room, or cottage with one or two rooms, known as the "bothy." Generally, arrangements are made for meals to be cooked in the farm houses and for the bothy to be cleaned up by a woman once a week. Sometimes, however, the men and lads make their own arrangements and take turns to perform their own cooking, make beds, light fires, and tidy and clean up. Women workers who do not live at home with their parents are usually lodged and boarded in the farm house.

Period of Engagement.—In the greater part of the country the married men are engaged for the year, the term extending either from the 28th May (Whit Sunday) or the 28th November (Martinmas). The half-yearly term is popular in some districts, but mostly amongst single men who are less willing to bind themselves for the whole year. There are very few weekly engagements—excepting amongst the few casual workers—and even women workers are usually engaged on yearly or half-yearly contracts.

Hiring.—Vacancies are usually filled as the result of inquiries or by advertisements in local newspapers. Most of the new engagements which take place each term are made by private bargaining, the basis of agreement being on the lines advised by the organisations of employers and workers. The hiring fairs are still well recognised all over the country, but they are used mostly as occasions for bargaining between farmers who have not succeeded in filling all their vacancies and workers who have been unable to obtain employment by other means. Almost every market town of any importance has its recognised hiring-fair day every half year, on which occasions it is usual to grant a holiday, without deduction of cash wages, to the whole staff of the farms in the neighbourhood.

Allowances.—In most counties there is a customary scale of allowances, but often the individual worker makes a bargain on a different scale according to the circumstances of his family. As an almost universal rule, the married ploughman is provided with a cottage on the farm, free of rent and rates. Except in a few counties a liberal supply of oatmeal forms an important addition to a worker's wages, the quantity varying from county to county, but the average being, at the time of the last inquiry, about 65 stones per annum. Perhaps the most valuable allowance, however, consists of the fairly liberal supply of milk usually provided to the farm worker's household. In general, the married ploughman receives a daily supply of fresh milk all the year round, sometimes as much as 4 pints per day in the summer; a reduction to about 3 pints being made in the winter months. In some areas it is not uncommon for the married ploughman to be allowed the keep of a cow, but in other districts the milk allowance itself has died out, although the workers are sometimes allowed to purchase milk at reduced prices. Potatoes or the produce of an allowance of potato ground are almost universally provided in part payment of wages. Coal is a common allowance in the counties north of Perth and Forfar, and in a few counties 1 or 2 loads of firewood are provided. The provision of free cartage of coal, firewood and flitting, reckoned as equivalent to from £1 to £4 per annum, is quite general. The allowances to single men are on the same basis, but the quantities provided vary greatly, the workers living in bothies being the most generously supplied.

Wages.—The total weekly wages of farm workers depend to a considerable degree on the quantity and the value of allowances provided. In addition they depend on the experience and ability of the worker and the nature of the occupation.

Hours.—As a general rule, throughout Scotland the working hours of the whole of the farm staff, with the exception of the cattleman and shepherd, are practically regulated by the hours of the ploughman. The stable work of the ploughman is considerably less for three or four months in summer when the horses are put out to grass, but the amount of time spent on stable work may be taken on the average to be about 7 hours a week. This means that, except for cattlemen and shepherds, ploughmen usually perform 7 hours per week more than other workers. The Sunday duty and in cases the Saturday half-holiday duty are generally performed in turn on farms where more than one ploughman is employed. The general working day for ordinary workers throughout Scotland during the summer before the War was recognised as 6 a.m. to 6 p.m., with 2 hours off at dinner time. During the four winter months it was usual to work from dawn to dusk with an hour's interval at mid-day—roughly from 7.30 to 4.30. On most farms the working hours on Saturday were the same as on other days, but in some parts of the country it was becoming customary to stop work at 4 p.m. or 3 p.m. and sometimes at 1 p.m. For the greater part of Scotland the pre-war working day may be reckoned as 35 weeks of 60 hours and 17 weeks of 48 hours' average, to which for the ploughman must be added 7 hours per week for stable work. No overtime was paid for any excess hours, and the only general holidays were New Year's Day and one or two hiring-fair days.

The Farm Servants' Union which before the War had already obtained some measure of success in reducing the length of the working day, suspended its activities in this direction during the War, but after the Armistice this body met in conference with the National Farmers' Union of Scotland. As a result working hours were in many districts agreed on the 9 hours per day basis for 42 weeks, 8 hours per day for 6 weeks in the short days in winter, and 10 hours per day for 6 weeks in hay time and harvest, with overtime to be paid after 10 hours have been worked on any day.

The 1919-20 Report of the Board of Agriculture for Scotland states that in general, farm work is now based on the 9-hour day and commences either at 6 a.m. or 7 a.m., and finishes at

5 p.m. or 6 p.m. according to the season, with 1 hour, $1\frac{1}{2}$ hours, and sometimes 2 hours for dinner. In winter the working day is from dawn to dusk with an hour's interval. Frequently a half holiday is given on Saturdays and in many instances farmers are allowing 14 days' holiday each year. Taking an average throughout the country, the ploughman's working week is about 50 hours besides about 7 hours' stable work, which shows an average reduction of about 5 hours a week compared with pre-war working hours. Cattlemen's hours vary according to the number of stock and the period of the year. The Report states that when the cattle are under cover the usual hours are about 9-10 per day in addition to Sunday duty. It is not possible to fix the working hours of shepherds, which vary from a few hours daily supervision of the flocks when all conditions are favourable, to 12 hours and upwards per day during lambing, dipping and clipping time or during periods of disease. The hours of orramen and permanent women workers are usually the same as those of the ploughmen, except that they have no stable work. At present, however, there appears to be a general tendency to increase the length of the working day.

* * * * *

LESSONS OF THE IMPERIAL FRUIT SHOW, 1921.

In view of the near approach of the 1922 Imperial Fruit Show the moment is opportune for a short account of the score-card marking by the Judges of the exhibits submitted at the Show last year, in order that intending competitors may have an opportunity of studying the various points before they pack their produce for competition at the Show this year.

The Schedule in 1921 was drawn up to meet the needs of the commercial grower: but while the rules were so framed as to induce the grower to exhibit packages of fruit similar to those ordinarily sent to the market, it was naturally expected that the sample of fruit and the manner of presentation would be above the average. The Show then was important as an educational movement tending to improve the existing methods of grading and packing fruit for the market.

It must be remembered that the grower seldom sees his produce in the market, and his success in grading and packing can only be judged by him from the prices which he receives for the same fruit presented in different ways. This method

of measuring results is clearly unsatisfactory because of the fluctuations of the market and the many factors which influence the price obtained. At the Imperial Fruit Show, however, growers were able to see their boxes of apples staged alongside those sent from other parts of the country and to compare the results of their efforts with those of others. The comparisons in some cases were pleasing, in others less so, but in the latter cases the road for improvement in the future was clearly evident to those wishing to see and travel along it.

But the comparison of the boxes of fruit was not the only way in which exhibitors could find out their defects or merits, for there was a fairly efficient barometer which could be studied with advantage by all, namely, the score-card compiled by the Judges. Each exhibit was given marks for the fruit, and for the way in which it was graded, packed, and presented. It was important that growers should know exactly the marks they received for their exhibits, and the Ministry therefore sent to each exhibitor a detailed account of the marks awarded for his particular exhibit—a piece of work which was favourably commented upon by growers. Every exhibitor therefore knows exactly what were his strong and his weak points at the last Show, and this information should assist in raising the standard of exhibits this year. It is not necessary or even possible in this article to deal with any special exhibit, but a comparison of the average marks obtained in the three Sections as shown in the following table may be of interest:—

STATEMENT SHOWING AVERAGE MARKS AWARDED IN THE KENT,
EASTERN COUNTIES AND WEST MIDLANDS COMMERCIAL SECTIONS
OF THE IMPERIAL FRUIT SHOW OF 1921, EXPRESSED AS
PERCENTAGES OF THE MAXIMUM MARKS OBTAINABLE.
SCORE CARD.

Section.	Best Commercial Size.	Colour, finish, Skin, Quantity.	Condition:		Uniformity of colour and size.	Quality of Pack.	General appearance of entry.	Total Points.
			Soundness, firmness, freedom from blemish, flavour, quality of Apples.	per cent.				
Kent	99	80	89	80	70	per cent.	per cent.	per cent.
Eastern Counties	80	73	76	73	73	80	76	74
West Midlands	80	80	76	73	60	60	71	

It will be observed that pride of place is taken by the Kent section. This is by no means surprising when it is remembered

that Kent is the oldest fruit-growing county and that by virtue of longer experience the Kentish growers have had greater opportunities of becoming more skilled. The venue of the Show (Crystal Palace) enabled much of the produce in the Kent section to be delivered direct in motor lorries over comparatively short distances; whereas in the other sections the boxes of fruit were sent long distances by rail. Too much importance, however, can be attributed to this, as the marks awarded for the general condition of fruit sent from the Eastern Counties and West Midlands were only slightly below those obtained by Kent. The figures appear to indicate that the Kent apples secured a considerable lead because of the care taken in selecting the best size, or, at any rate, a size which, in the opinion of the Judges, was the best commercial size. In colour, finish and skin quality the Eastern Counties fruit would seem to be behind that of the West Midland and the Kent sections, and this may be attributable to several factors. The apple of the West has long held a reputation for colour and quality, though this is counterbalanced to some extent by the effects of diseases and pests. The Kent climate is not so favourable to the production of a high colour, but the Kentish growers generally adopt hygienic methods for keeping pests and diseases, as far as practicable, under control. The climate of the Eastern Counties is by no means conducive to high colour or finish in apples, nor do the growers energetically deal with diseases and pests, and so their apples have fallen into the third place. Even in a few exhibits where fruit from the lighter soils of the Eastern Counties possessed high colour, marks were lost considerably on skin quality.

In marks obtained for "condition," under which is included firmness, soundness, freedom from blemish and flavour quality, Kent again holds a slight lead over the other two sections. This, however, may be misleading to those who examined the various classes towards the end of the Show when it was seen that the soundness and firmness of many leading exhibits had very much deteriorated. It was clearly indicated here that climatic conditions play a very important part in the soundness and general keeping qualities of apples, especially in such an abnormal season as was experienced in 1921. Their blemishes usually account for a good deal of rotting among closely packed apples, but in this case the rapid rotting of clean fruit on the third and fourth day of the Show was much in evidence. This applies particularly to the large

culinary varieties in the Eastern Counties section, but similar varieties in the West Midland section retained their condition throughout the Show.

Much can be attributed to the influence of soils on "condition" as well as on the colour of apples. The wastage of fruit grown on the moist soils of the Severn Vale was practically nil in comparison with that of the fruit from the thinner soils of the East Coast.

It will be seen, therefore, that, had the items under "condition" been separately recorded on the score-card, the loss or gain of marks awarded for each particular point of quality might be traced to both soil and climate. Such data would be of considerable value in the future development of the industry in regard to varieties and their suitability for any desired short or long distance market. The total marks awarded for uniformity of colour and size tend to indicate the ability and experience of the grower properly to grade and pack his fruit, and it is here that the Kent section probably leads in experience alone, as it was apparent to the observer that a number of exhibitors in the other two sections were making their first attempts at modern grading and packing.

It is in this direction, it would appear, that future exhibitors can reach a higher standard of excellence by studying carefully the number of marks gained by them under these two headings at the previous Show.

"Quality of pack" might be looked upon as the determining factor in deciding whether a grower is adopting an up-to-date and commercial method. It may be desirable to mention, however, that too much should not be assumed from the award of marks for this at the last Show. Various forms of packing, good and bad, were used in all three sections, for the reason that no rules defining any standardised system were laid down, and it became obvious that varied opinions would exist among the Judges on this extremely important and technical subject. The need for a standardised method of packing boxed apples was clearly borne out midway through the Show when cases of apples with premier awards were showing considerable damage and rotting through being packed attractively in the first place, but not commercially, as was ultimately proved by later observations. Nevertheless, the summarised results of the total percentage of marks for the three sections go a long way to show where the present standard of grading and packing is low and where educational work of this nature is mostly desired.

The final item on the score-card, namely, the awarding of marks for the general appearance of entry, is also an important matter. Unclean packages, torn lining paper, unnecessary packing materials, etc., do not command that attention which is readily obtained from buyers if a little care is given to the style and attractiveness of a package of fruit, whether exposed for sale or unopened. The value of an attractive appearance should not be underestimated when placing a package of quality apples before the public, whether for sale or exhibition.

At the forthcoming Imperial Show, exhibits not complying with the standard commercial regulations recently recommended by the Advisory Committee will be disqualified by the Judges, and exhibitors should pay special regard to the rules governing packages and style of "packs" to be used.

* * * * *

NOTES ON FEEDING STUFFS FOR OCTOBER.

E. T. HALNAN, M.A., Dip. Agric. (Cantab.),
Ministry of Agriculture and Fisheries.

The Use of Roots for Stock Feeding.—The root crops this year promise on the whole to be very good, and on most farms roots will be in abundance for use for feeding stock. A few notes on the feeding of roots may therefore be welcome here. Under the term root crops, we include as a general rule, potatoes, carrots, swedes, turnips, kohl rabi, mangolds and sugar beet.

Composition.—Root crops are all succulent foods, containing a large amount of water, varying from approximately 75 per cent. in the potato to over 90 per cent. in the turnip. In fact, the turnip contains less solid matter than milk. Roots are "starchy" foods, that is, they contain a large amount of starchy or sugary material, and very little protein or flesh forming material. Potatoes are rich in starch (about 21 per cent.), sugar beet is rich in sugar (15-20 per cent.), and carrots, mangolds, swedes and turnips, although they contain less than 10 per cent. of starchy material have it in the form of easily digestible sugars.

Use.—Root crops are bulky foods and are therefore largely used for ruminating animals such as cattle and sheep, although they are of distinct value to pigs when fed in smaller quantity. They form a succulent feed, and owing to their cooling and laxative effect, are very suitable for use with straw and certain

[Oct.]

DESCRIPTION.	Price per Qr. s. lb.	Price per Ton. £ s. £ s.	Mannurial Value per Ton. £ s. £ s.	Cost of Food Value per Ton. £ s. £ s.	Starch Equiv. per 100 lb. Unit, Starch Equiv. s. d.	Price per lb., Starch Equiv. s. d.
Wheat, British -	*41/6	504	9 4	1 0	8 4	71 6
Barley, British Feeding	*31/6	400	8 16	0 18	7 18	71
" Canadian No. 4 Western	-	-	-	0 18	-	71
Oats, English White -	-	-	-	0 19	-	59 5
" Black & Grey	*26/-	336	8 13	0 19	7 14	59 5
" Scotch White -	-	-	-	0 19	-	59 5
" Chilian -	*28/-	320	9 16	0 19	8 17	59 5
" Canadian No. 2 Western	32/-	320	11 4	0 19	10 5	59 5
" No. 3	29/3	320	10 5	0 19	9 6	59 5
" No. 2 Feed	28/-	320	9 16	0 19	8 17	59 5
" American -	25/-	320	8 15	0 19	7 16	59 5
" Argentine -	27/3	320	9 11	0 19	8 12	59 5
Maize, Argentine -	43/6	480	10 3	0 17	9 6	81
" American -	36/-	480	8 8	0 17	7 11	81
" South African	38/6	480	9 0	0 17	8 3	81
Beans, Rangoon -	8/-	112	8 0	1 15	6 5	67
Peas, Japanese -	41/-	112	41 0†	-	-	-
Buckwheat -	52/-	392	14 17	-	-	-
Millers' offals—						
Bran, British -	-	-	6 7	1 16	4 11	45
Broad Bran -	-	-	8 0	1 16	6 4	45
Fine middlings (Imported)	-	-	9 2	1 7	7 15	72
Coarse middlings (British) -	-	-	8 5	1 7	6 18	64
Pollards (Imported)	-	-	6 15	1 15	5 0	60
Rice Bran -	-	-	7 15†	-	71	-
Barley Meal -	-	-	11 5	0 18	10 7	71
Maize "	-	-	9 5†	0 17	8 8	81
" S. African	-	-	9 0	0 17	8 3	81 3
" Germ Meal -	-	-	9 2	1 5	7 17	85 3
" Gluten-feed	-	-	9 0	1 11	7 9	75 6
Locust Bean Meal -	-	-	8 15	0 9	8 6	71 4
Bean Meal -	-	-	13 10	1 15	11 15	67
Fish -	-	-	15 0	5 10	9 10	53
Linseed" Cake, English (9% oil)	-	-	12 12	2 6	10 6	74
Cottonseed " English (5% oil)	-	-	7 15	2 6	5 9	42
" " Egyptian (5% oil)	-	-	7 10	2 6	5 4	42
Decorticated Cottonseed Meal (9% oil)	-	-	12 0	-	-	-
Coconut Cake (6% oil)	-	-	9 15	1 19	7 16	73
Palm Kernel Cake (6% oil)	-	-	7 10†	1 9	6 1	75
" " Meal (14-2% oil)	-	-	6 2	1 9	4 13	71 3
Feeding Treacle -	-	-	4 15	1 1	3 14	51
Brewers' grains, dried, ale porter	-	-	8 0	1 11	6 9	49
" " wet, ale porter	-	-	1 3	0 8	0 15	15
" " wet, porter	-	-	0 19	0 8	0 11	15
Malt culms -	-	-	8 0†	2 3	5 17	43

* New.

† At Liverpool.

NOTE.—The prices quoted above represent the average prices at which actual wholesale transactions have taken place in London, unless otherwise stated, and refer to the price ex mill or store. The prices were current at the end of August and are, as a rule, considerably lower than the prices at local country markets, the difference being due to carriage and dealers' commission. Buyers can, however, easily compare the relative prices of the feeding stuffs on offer at their local market by the method of calculation used in these notes. Thus, suppose palm kernel cake is offered locally at £10 per ton. Its manurial value is £1 1s. per ton. The food value per ton is therefore £8 1s. per ton. Dividing this figure by 75, the starch equivalent of palm kernel cake as given in the table, the cost per unit of starch equivalent is 2s. 2d. Dividing this again by 12 1/2, a similar calculation will show the relative cost per lb. of starch equivalent of other feeding stuffs on the same local market. From the results of such calculations a buyer can determine which feeding stuff gives him the best value at the prices quoted on his own market.

concentrated feeding stuffs that have a "binding" tendency when fed to live stock.

Quantity to Feed.—If sheep are allowed an *ad lib.* diet of roots and hay, it will be found that the maximum quantity of roots they will eat is approximately 16 lb. a day. Cattle will take up to 1 cwt. of roots per day, but it is not wise to exceed $\frac{3}{4}$ cwt. a day, except perhaps in cases where concentrated cake is fed lavishly, as with animals brought up under show conditions.

Preparation for Feeding.—It is usual, especially in feeding cattle, to pulp or slice roots when feeding with hay or straw. The usual practice is to chaff the hay or straw, mix with the sliced roots, and allow to stand for 12 to 24 hours before feeding. This seems to soften the chaff and makes a mixture relished by stock. Roots may be fed whole, as is the general practice with sheep, but in the case of horses it is always advisable to slice before feeding, especially if the roots have a tendency to be woody.

Time to Feed.—The usual practice in feeding roots is to feed off turnips first, follow with swedes and finish on mangolds. It is always a sound practice, if possible, to avoid feeding mangolds before Christmas, as new mangolds tend to cause scour.

* * * * *

In the course of the inspection of statutory small holdings in Lindsey (Lincs.), the Ministry's District Commissioner noticed

A Lincolnshire Small Holding. a holding which appears to merit a description in some detail. The holding is situated at Bradley, three miles from Grimsby. It comprises 39 acres of arable land, the soil being a strong loam, and the rent is £2 2s. Od. per acre.

Three brothers, all unmarried ex-Service men, live on the holding. The holding was let to the eldest of the brothers at Lady Day, 1919, as bare land at an economic rent. Before joining up, the tenant was a carter in Grimsby, and his entire capital was derived from his savings as a carter.

The tenant has himself provided on the holding a small timber-built bungalow, a stable, a cowhouse, a place for calves, a large piggery and an outhouse, concrete being used throughout for flooring. Also an implement hovel roofed with straw, poultry houses, and a road-way to the bottom field faced with ashes two feet thick and a post-and-wire fence to fence off a paddock have been made. Altogether, he has expended about £600 on the equipment of the holding exclusive of the labour of carting.

The holding was taken in a bad condition and foul land had to be cleaned. After three years of tenancy, the land is in a high state of cultivation and very clean. Hundreds of loads of fish refuse have been carted from Grimsby Docks, four miles distant, all the arable land having been manured in this way. In addition, farmyard manure has been used and basic slag is being put on the permanent pasture. Seed potatoes direct from Scotland are planted.

The tenant's elder brother works the horses: the younger brother, much disabled as a result of War service, keeps house and looks after the poultry. The tenant himself supervises, delivers market-garden produce to retail shops in Grimsby, and sells and delivers bundles of green clover to carters in Grimsby. He fills in his spare time on the holding from early morning till late at night.

In view of the possibility of a slump in the sale of vegetable produce, the holding has been variously cropped this season as follows:—

4	acres wheat.
6	„ oats (winter and spring).
3	„ barley.
7	„ potatoes (early, medium and late).
9	„ clover.
1	„ vetches.
2	„ swede turnips.
1	„ mangolds.
2	„ cabbages.
$\frac{1}{2}$	„ carrots.
3	„ permanent pasture.
$\frac{1}{2}$	„ homestead.

The live stock on the holding consists of:—3 working horses, 1 mule, 2 cows, 6 calves, 40 pigs, 60 head of poultry.

The water supply to the holding is provided free of cost by the resident tenant of an adjoining property who laid down a pipe across the boundary at his own expense in consideration of the fact, as he said, that his neighbour had served his country during the War.

Owing to the high state of cultivation of the holding the effect of the drought last year on spring oats, clover and potatoes was not nearly so noticeable as on some other land.



THE Ministry of Agriculture and Fisheries desires to give notice that the "Seeds Regulations, 1921," which were made by the "Seeds Regulations, 1921," which were made in pursuance of the provisions of the Seeds **Seeds Regulations, 1921.** Act, 1920, were withdrawn as from the 10th August, 1922, and have been replaced

by the "Seeds Regulations, 1922." The terms of the new Regulations are practically identical with those of the previous Regulations, except as regards the following points:—

1. Grass and Clover Seed when sold, or exposed for sale, for other than agricultural purposes (*e.g.*, as lawn grass seed), will be excluded from the operations of the Seeds Act.

2. A statement as to the percentage of pure germinating seed or "real value" of grasses and clovers is no longer required.

3. Alsike and White Clover, when grown together, may be treated, for the purpose of the Regulations, as one seed, provided they are declared to have been grown together.

4. Sprouted Cereal Seeds are not to be treated as impurities for the purpose of testing, that is to say, they are not to be picked out of the sample put up for the germination test.

5. The authorised minimum percentage of germination in the case of Broccoli and Cauliflower Seed is reduced from 65 per cent. to 60 per cent.

6. Seed Potatoes, the variety of which is less than the Standard Purity of 97 per cent. may now be sold as seed potatoes, provided such potatoes are declared as being of mixed varieties.

Copies of the Seeds Act, 1920, and of the Seeds Regulations, 1922, may be obtained through any bookseller, or directly from H.M. Stationery Office, Imperial House, Kingsway, net price 3d. each.

* * * * *

As from 1st August, 1922, the following increases were made in the fees charged by the Official Seed-Testing Station for testing samples of seeds:—

Increased Seed-Testing Fees.	Old Fee.	New Fee.
Grasses and Clovers	4s.	5s. per sample.
Mixtures of Grasses and Clovers	4s.	10s. "

Mixtures of Perennial and Italian Ryegrass, and mixtures of Alsike and White Clover, when stated to have been grown together, will not be regarded as mixtures and will be tested for 5s. per sample.

Special facilities are now offered for carrying out tests on payment of the ordinary fee plus an additional charge of 50 per cent. thereof, and the cost of telegraphing the result of the test if a telegram is asked for. These facilities are only granted to samples which are plainly marked with the word RAPID. No other form of words will be recognised.

All other fees, including the farmer's fee of 6d. per sample, remain unchanged.

A leaflet, giving full particulars of the fees and conditions of testing, can be obtained, post free, on application to the Chief Officer, Official Seed-Testing Station, Huntingdon Road, Cambridge.

* * * * *

An Order entitled The Irish Animals Order of 1922 has been issued by the Ministry modifying the restrictions imposed in

**Landing of
Animals from
Ireland.**

respect of the landing of cattle, sheep, goats and swine from Ireland, so as to permit of the landing both of fat and store animals of each species.

Cattle and sheep may not be removed from the landing places except with a licence granted by an Inspector of the Ministry, and then only to—

(a) Markets specially authorised by the Ministry, from which they will be moved by licence to private premises for detention thereon for 13 days, or

(b) Private premises for detention thereon for a like period unless slaughtered in the meantime.

The following special markets have been approved in Scotland, viz., Aberdeen, Edinburgh, Forfar, Laurencekirk, Perth and St. Boswell's, and the Ministry is now inquiring into the demand for a similar number of special markets in England.

Swine may be removed from the landing places with the requisite licence granted under the Swine Fever (Movement from Ireland) Orders of 1904 or 1906, as the case may be.

An Important Prosecution.—For contravening the Animals (Landing from Ireland) Order of 1922, several cattle dealers have been recently prosecuted and in some cases very heavy fines inflicted.

An outstanding conviction was that obtained against an Irish dealer for several offences against the Order. These included the moving of cattle to a place other than that named in the licence granted him and failing to surrender the licence in the

manner prescribed in the Order. In inflicting a fine of £101 5s. the offender was severely censured by the magistrates who said that the offence might have cost the country an enormous sum of money.

In view of the urgent necessity for preventing the spreading within this country of Foot-and-Mouth Disease, it is essential that the strictest attention should be paid, by cattle dealers and farmers, to the compliance with the requirements of Orders relating to the movement of cattle. It should be unnecessary to point out that such Orders are designed solely to protect the interests of the cattle industry.

Persons obtaining licences for movement of animals should make themselves thoroughly acquainted with the conditions under which they are issued and the obligations attaching hereto.

* * * * *

DURING the first four months of operation of the Agricultural Development Board* of Ontario, the Province has lent to farmers Agricultural Credit in long term loans \$571,570 and in short term loans \$25,000. The extent of the

in Ontario. demand for Government loans is indicated by the fact that 3,000 applications have been received. It is stated that the scheme is achieving one of its chief objects in keeping many farmers' sons on the land. The father secures a loan from the Government to buy an adjacent farm for his sons, mortgaging both farms in order to get the loan. The system also enables city men, who have had perhaps some farm experience in youth, to take up farming. Farmers who have lost their buildings through fire are also aided. 75 per cent. of the applications are for loans for building purposes. In some cases loans are obtained to pay off existing encumbrances, as loan companies demand 7½ per cent. to renew, whereas the Agricultural Board lends the money to the farmers at 6 per cent.

There is a strict system of local inspection in order to prevent undesirable persons from getting loans. The Board charges \$12 as inspection fee in granting a loan, and legal fees of \$10 on loans up to \$2,000 and \$20 on loans up to \$12,000. The farmer can safely do without a lawyer when dealing with the Board. Long term loans have been granted to farmers in 32 counties.

At least a third of the applications have come from northern Ontario, which is the part of the province not yet fully developed.

* Cf. *Industrial and Labour Information*, Vol. I, No. 7, p. 411.

In that district the loan companies charge 10 per cent. interest and limit their advances to 40 per cent. of the value of the property.

Short term loans can be secured only through farm loan associations composed of 30 farmers, each of whom has subscribed for a \$100 share and paid in \$10. The municipality and the province in which the farmers live have to make a similar contribution. Farmers from every county in the province have asked for information concerning such associations, but the Board takes no action until five or more farmers have so petitioned. The first association was formed last December. At present 25 are operating, and many others are nearly completed.

These short loans are intended chiefly for the purchase of cattle and seed. Money is lent to the association by the Government at $5\frac{1}{2}$ per cent. and advanced to the farmer by the association at $6\frac{1}{2}$ per cent. The maximum loan is \$2,000. As the bank short loans are limited to three months and farmers need money for a period of nine months, the new provincial scheme meets a real need.

* * * * *

In 1913 the Ministry published Miscellaneous Publication No. 18 on willow-growing, based largely on information supplied

The Cultivation by Mr. W. Paulgrave Ellmore, of
of Osiers Leicester. A new edition of this pub-
and Willows. lication has now been issued and can

be obtained by ordering direct from
the Ministry, 10, Whitehall Place, London, S.W.1, price
1s. 6d. net post free. It has been largely re-written,
a chapter on the growing of tree willows has been added,
and the notes on the cultivation of basket willows expanded,
greater stress being laid on the special methods employed in the
various willow-growing districts, each of which had evolved
certain characteristic features. The booklet has been revised by
the members of the Advisory Committee on Willow Growing set
up by the Ministry, and is fully illustrated.

* * * * *

Foot-and-Mouth Disease.—An outbreak of Foot-and-Mouth Disease occurred in Water Street Pig Market, Manchester, on the 24th August, after Great Britain had been free from outbreaks since the 30th June last.

The usual restrictions were imposed and every step taken to trace the origin of the disease. Up to the present, however, this has not been discovered.

There have been no further outbreaks either in the Manchester district or in any other part of the country.

Rabies, Southampton.—A case of Rabies in a dog at Itchen, in the Borough of Southampton, was reported on the 5th May, and the nature of the disease was confirmed by the Ministry. A muzzling and prohibition of movement Order, covering a radius of 15 miles from Southampton, was made. No further case having occurred in the district, all restrictions were withdrawn as from the 10th September.

Leaflets issued by the Ministry.—Since the date of the list given in page 286 of the June issue of the *Journal*, the following new leaflets have been issued:—

- No. 386.—Ragwort.
- " 387.—Spurrey.
- " 390.—Description of Certain Diseases of Animals.
- " 392.—Cultivation of Catch Crops and Home Grown Feeding Stuffs.
- " 393.—Tomato Culture.
- " 394.—Phosphatic Fertilisers.

The following have been revised or rewritten:—

- No. 33.—Surface Caterpillars or Cutworms.
- " 72.—Purchase of Artificial Manures.
- " 122.—Cabbage Root Fly.
- " 156.—Hedgerow Timber.
- " 189.—Insurance of Farming Stock against Fire.
- " 258.—Rural Party Line Telephones.
- " 34.—The Woolly Aphid.
- " 63.—Destruction of Charlock.
- " 98.—Grading and Packing of Apples.
- " 167.—Duck Keeping for Egg Production and Table.

* * * * *

NOTICES OF BOOKS.

Veterinary Hygiene.—(R. G. Linton, M.R.C.V.S., Professor of Hygiene, Royal (Dick) Veterinary College, Edinburgh. Royal 8vo; 415pp., 92 illustrations. Edinburgh 1922, W. Green & Son Ltd., price 26s. net.) This volume is one of the Edinburgh Veterinary Series of which the general editor O. Charnock Bradley, M.D., D.Sc., M.R.C.V.S., Principal, Royal (Dick) Veterinary College, Edinburgh. It is intended for the use of students, veterinary practitioners and others concerned with the wellbeing of animals. Sections on water, meteorology, sanitation, air and ventilation, building instruction, preventive medicine and sanitary law are dealt with in a lucid manner without raising too many controversial topics. The author has received considerable help from many experts and quotations are numerous. A bibliography at the end of each section would, however, have enhanced the value of the volume considerably and helped those desirous of more detailed study.

The section on building construction is praiseworthy and practical, and fills long felt want in books dealing with veterinary hygiene. Particulars of the instruction and ventilation of live stock carrying vessels are not given, but useful and essentially practical information is furnished concerning buildings for animals with the exception of kennels and goat houses. Findlay's method

of ventilating cowsheds, which is largely used in the S.W. of Scotland, is described by the author as the ideal one. The use of fireclay ridge ventilators is condemned. A system of lighting cowsheds whereby the hindquarters of the cows are clearly visible is recommended, and those interested in the production of clean milk will profit by the study of the notes given. The text dealing with the reconstruction of insanitary buildings could be improved on by illustrations showing what can be done with existing walls. Whole-time municipal veterinary officers are frequently called upon to draw up a specification of work required in reconstructing insanitary cowsheds, but one looks in vain to the work under review for assistance. Methods of reporting on buildings and animals are also omitted.

Preventive medicine is discussed in a masterly manner, and many up-to-date hard facts are quoted in connection with the scheduled diseases. The author is in error in stating that "in the case of Swine Fever the disinfection is under the control of the lay inspectors of the Ministry of Agriculture, the Veterinary Inspector has nothing to do with it." Further notes on the disposal of carcasses are desirable and in these days of economy it is somewhat surprising to see so much space devoted to Bostock's expensive method of cremation.

Tuberculosis in animals is dealt with in detail and the statement is made that milk from a tuberculous udder always contains Tubercle bacilli. Some of the parasites found in animals are described and much useful information is given concerning their control and eradication.

The section on Sanitary Law is dealt with in a concise manner and herein lies its weakness. Many important Acts and Orders do not receive notice and important legal decisions are not supplied. While discussing law it is always advisable to quote the relevant section or article.

Although a few points in which improvement could be made have been mentioned, the book can be thoroughly recommended as a safe guide and the author deserves congratulations for having condensed the subjects under discussion admirably. The publishers have performed their duty in their usual thorough manner.

Insect Pests of the Horticulturist: Their Nature and Control. Vol. I.—Onion, Carrot and Celery Flies.—(By K.M. Smith and J. C. M. Gardner; Benn Bros. Ltd., London; price 7s. 6d. net.) Vol. I of this work deals with the bionomics and some control trials undertaken against the Onion, Carrot and Celery Flies. Structural and other figures are given in black and white, the book should prove useful to students and others interested in Economic Entomology.

